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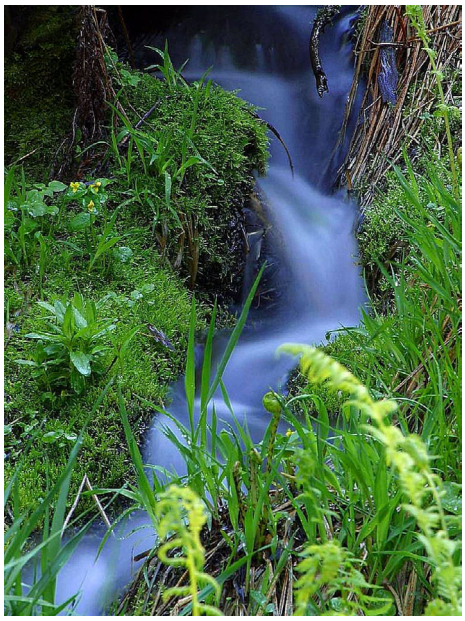
Changing Landscapes

Land use planning curriculum for natural resource professionals

Principles, people, and policies
Land planning and pressures
Approaches
Natural resource planning tools



P1 – *An American History of Planning*
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Changing Landscapes: A Land Use Planning Curriculum for Natural Resource Professionals

The Changing Landscapes series of 21 factsheets is intended to help urban foresters, service foresters, fire specialists, and other natural resource professionals become more familiar with land use planning—what it is, the policies that direct it, and the tools used to carry it out. The hope is that a better understanding of land use planning will help natural resource professionals be more confident and informed to ensure that natural resources are considered, protected, and sustainably managed to the greatest extent possible when planning decisions are made that affect land use across the rural-to-urban continuum.

Three consultants representing the Mid-Atlantic, Northeast, and Midwest were awarded contracts to write the factsheets with input from a diverse group of partners representing urban and community forestry, fire, and stewardship programs throughout the region served by Northeastern Area State and Private Forestry. Each factsheet identifies the author(s) who wrote it.

The document was produced by the U.S. Forest Service, Northeastern Area State and Private Forestry:
Sandra Clark, Editor
Donna Marie Foster, Project Leader and Editor
Deborah Muccio, Designer

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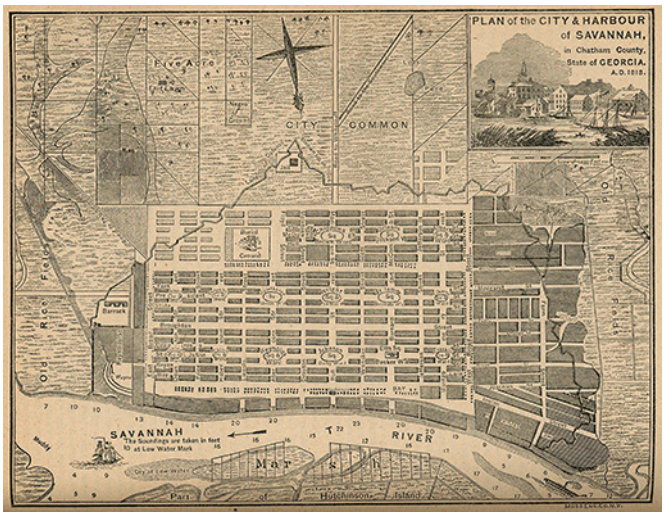
P1: An American History of Planning



Plan of the City and Harbour of Savannah, Georgia, United States, drawn out in 1818.

Overview

This factsheet gives an overview of the formative years of planning in America from the late 17th century through the early 19th century. It provides insight into planning and zoning that were influenced by the Progressive Era, social reform, abusive use of natural resources, and laissez-fair capitalism. This factsheet discusses the influence of planning boards on planning in American cities and the realization that zoning could provide orderliness and control of urban development. It expands on how movements such as the City Beautiful Movement, City Practical Movement, and the Environmental Movement made great strides in sound planning, including environmental planning. Finally, it provides a brief conclusion about planning challenges we face today.

In the Beginning: The Formative Years

The origin of almost every city in the country was a plat plan showing the proposed layout of streets, municipal boundaries, parks, and building lots. The original plat plans for Philadelphia and Savannah, GA, represent the first "planning" in America. Philadelphia's plan was drawn by surveyor Thomas Holme for William Penn in 1682. The famous plan was a rigid grid of streets with five evenly spaced blocks for parks. It depicted a town of single-family houses and shade trees encircled by a greenbelt. James Oglethorpe's 1733 plan for Savannah used rectangular streets with interspersed and connected parks along avenues. Trees, parks, and greenspace have always been important in planning.

Much of the planning in early 19th century American cities was undertaken by civic improvement and beautification committees concerned with poor sanitation, ugliness, and crowding of cities. These organizations were often privately financed and distrustful of the political corruption that was commonly found in many cities. There was tremendous population growth, speculation, and building in American cities by the end of the 1870s spurred by the Industrial Revolution in America and the associated immigration of Irish, Chinese, Italian, and other nationalities as well as the influx of rural southern African-Americans to northern industrial cities after the Civil War.

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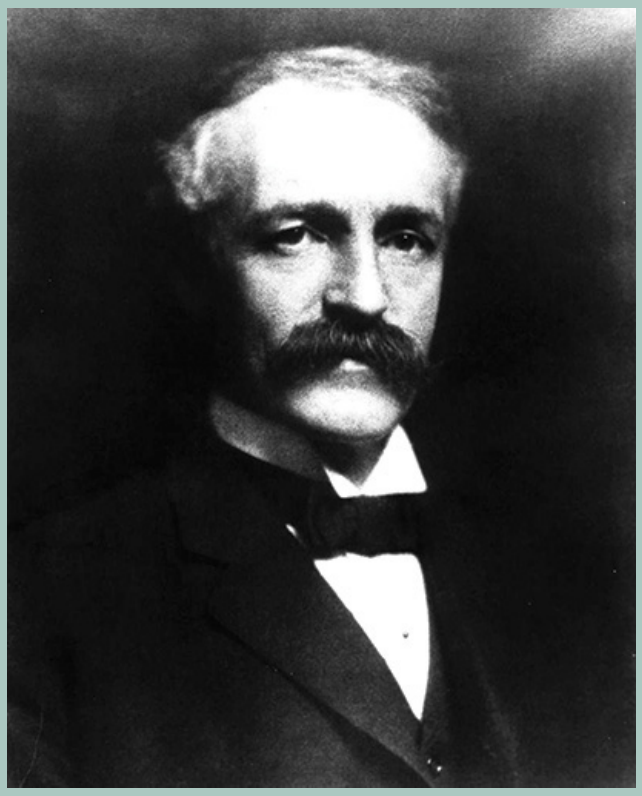
The Progressive Era of Physical and Social Reforms: 1870 to 1920

The technology of the Civil War; the flood of immigrants from other countries and the South; and the intensive and often abusive use of forests, coal, water, and other natural resources all combined to feed the growth of American cities. Between 1900 and 1910, the country's population grew by 16 million people, and by 1910 fully half of the population lived in urban places. The laissez-fair capitalism promoted by Adam Smith in *Wealth of Nations* was a prevailing doctrine.

Although the great industrial cities flourished, they were also places of chaotic growth, congestion, ill health, pollution, fire, poor light and ventilation, social injustice, speculation, and corruption. Tenement slums—houses in the shadow of the factory—sprang up, and the conditions of urban life, especially for immigrants and workers, were bleak and hazardous. At the same time, there were major advances in telephone communications, electricity, rail transportation, water authorities in Boston and New York, and other public services—all occurring faster and at a larger scale than at any other time in history.

The first National Conference on Planning was held in 1909, supported by the New York City Commission on Congestion of Population. By 1913, there were planning boards—the predecessors of today's planning commissions—in 18 American cities, and some State legislatures made planning a mandatory responsibility of local government.



First Forest Service Chief and conservationist Gifford Pinchot worked with preservationist John Muir and President Teddy Roosevelt to have Congress set aside roughly 16 million acres of national forest land in 1907 and establish the U.S. Wildlife Reserve System.
(Photo: Grey Towers National Historic Site)

Preservation of American Forests

Starting at the same time as the Progressive Era in city planning, conservationist Gifford Pinchot, later the first Chief of the U.S. Forest Service; preservationist John Muir, founder of the Sierra Club; and outdoorsman President Theodore Roosevelt allied publically against a U.S. Congress that was increasingly hostile to the reservation and management of public forests. Their efforts resulted in the setting aside of some 16 million acres of national forest land in 1907 and the establishment of the U.S. Wildlife Reserve System. Many years later, pushed by activists Aldo Leopold and Bob Marshall, the Wilderness Act was passed in 1964, the Wild and Scenic River Act in 1965, and the Endangered Species Act in 1977. America's national forest and park system was framed by the principles of preservation, conservation, and economic determinism. And today, arguments over multiple uses of Federal lands continue.

The main emphasis of planning during the Progressive Era was on overcrowded tenement housing, the location of unsafe and unhealthy industry, and uncoordinated real estate speculation and development. Planning as a social reform was seen as a way to improve conditions of the working class and immigrants. Governmental "police power" regulations—building codes, height limits, fire codes, tenement laws, and industrial districts—were first applied in an ad hoc, reactive, and localized manner.

Given the dismal conditions of many cities, however, many planners and architects believed that adequate solutions would come only from comprehensive city planning—studies and plans implemented by regulation, investment, and other such tools. They looked to German cities and their system of using zoning to control land use (districting), land value taxation, municipal ownership of undeveloped lands, and development planned by municipal government. Others, such as Frederick Law Olmstead, believed city planning should follow the path of technical expertise rather than regulation and public ownership. They believed that regulation must be limited because of the importance of private investment as a stimulus of growth and development.

In this complex arena, most planners and civic leaders began to realize that zoning could provide orderliness and control of urban development and real estate interests. When Los Angeles was faced with land and water pollution, fire, and other costs of chaotic development, it became the first city to use citywide zoning in 1909, with support from both the Chamber of Commerce and the Realty Board, to control the location of industry primarily to protect owners and developers of residential property.

At the same time, New York City attorney Edward M. Basset investigated a legal instrument that would allow the power of the people to regulate their own destiny. He proposed the following definition of zoning, which holds true today: "The regulation by districts under the police power of the height, bulk, and use of buildings, the use of land, and the density of population." Under this definition the first comprehensive zoning ordinance was enacted in New York City in 1916. The goals of the zoning ordinance were to protect business and residential areas, stabilize property values, provide a logical framework for urban landscapes, and reduce congestion and overcrowding. Some historians also believe that zoning was used to prevent the intrusion of immigrants into fashionable business and residential neighborhoods.

New York City attorney Edward M. Bassett (1863–1948) is considered the "Father of American Zoning" and one of the founding fathers of modern day urban planning. (Photo: http://en.wikipedia.org)

Hundreds of municipalities followed the actions of Los Angeles and New York by using zoning as a means to protect single-family, detached, owner-occupied houses. Although some considered this a noble endeavor, others raised questions of equity, justice, and bias because many zoning provisions disallowed multiple-family dwellings, which typically provided housing for African-American and immigrant families. Another concern about the early use of zoning was that it was applied after the city had taken shape.

The City Beautiful, City Park, and Garden City Movements: From Social Reform to Physical and Environmental Planning and Design

During the Progressive Era, several related initiatives known as the City Beautiful, City Park, and Garden City movements added a focus on the physical and environmental design of cities to address earlier planning concerns about social reform. One watershed event was the 1893 Chicago World's Fair, which astonished visitors from across the country and around the world with its electrified "White City." Architects Daniel Burnham, Frederick Law Olmsted Sr., and John Root designed the 600-acre site that featured an orderly arrangement of gleaming white buildings, lighted and tree-lined boulevards, fountains, parks, lagoons, monuments, and sitting areas. That highly planned vision, of course, contrasted starkly with the squalor and din of so many American cities.

The Garden City Movement

Borrowing from the designs of Englishman Ebenezer Howard, American designers Henry Wright and Lewis Mumford advocated in the 1920s for self-sufficient satellite cities that were connected by rail and encircled by green and agricultural belts. The movement enjoyed some success that was eventually overshadowed by auto-dependent suburbia. This design movement is credited with providing the ideas for today's planned-unit and cluster-density development practices.

Once inspired, people took action, and a tidal wave of city planning swept the Nation. Cities appointed committees of elite citizens who financed eminent architects or landscape architects like Daniel Burnham to design grand plans. Burnham wrote, "Make no little plans; they have no magic to stir men's blood." Following major urban fires, Burnham's 1906 plan for San Francisco and 1909 plan for Chicago were completed at colossal scales. All of these city plans included plenty of parkland and natural features.

> "Make no little plans; they have no magic to stir men's blood."
>
> —Landscape Architect Daniel Burnham

Together, the three interrelated movements—City Beautiful, City Park, and Garden City—formed the foundation for environmental planning in America, providing momentum for the creation of some of the largest regional and neighborhood park systems ever developed. Besides the large parks typified by the Chicago Forest Preserve and Philadelphia's Fairmount Park, over 2,000 neighborhood parks existed in 300 cities by 1910. Large parks were created in industrial American cities for reasons beyond the health, recreation, and other social benefits they provide. Philadelphia's Fairmount Park, for example, was originally established to protect the city's drinking water supply. Ultimately, the City Beautiful movement was criticized for disregarding the economic problems of citizens, being divorced from the reality of life in the cities, and costing too much.

The City Practical Movement: 1920 to 1930

The 1920s saw the emergence of a movement known as the City Efficient or City Practical approach to planning. This movement concentrated on providing plans that would improve the city as a commercial and investment center. The term "city engineer" was coined, and planning concentrated on reducing traffic congestion and residential densities as well as providing services such as utilities and public facilities, transit and rail systems, and water and sewer—all while promoting efficient government spending. Zoning continued to gain support as a means to keep development densities under control and to separate incompatible land uses to protect residential and other property values. Many civic leaders continued to believe that the public interest was better served by orderly development and growth rather than uncoordinated speculation.

In the 1920s, then-Secretary of Commerce Herbert Hoover appointed an Advisory Committee on City Planning and Zoning to prepare model planning acts, notably the Standard Zoning Enabling Act and the Standard City Planning Enabling Act. These model acts provided States with the legal rationale for granting planning and zoning authority to municipal government. At the same time, the U.S. Supreme Court bolstered that authority with a pair of major decisions in both the *Pennsylvania Coal* v. *Mahon* 1922 decision and the *Euclid* v. *Ambler Realty Co*. 1926 decision. These decisions basically held that municipal zoning was constitutionally valid unless shown to be clearly arbitrary and unreasonable with no substantial connection to public health, safety, or general welfare.

The Depression Years

The Stock Market Crash of 1929 caused both economic and social chaos. Real estate foreclosures and a growing gap between fortune and poverty signaled a pressing need for city planning. While there was little direct attention to that need during the years between the Great Depression and World War II, several important supporting initiatives were launched under President Franklin Roosevelt's sweeping New Deal. Key among these measures was the creation of the National Resources Planning Board, Soil Conservation Service, and Civilian Conservation Corps, all of which addressed the condition of the Nation's land and water resources, which was especially critical during the Dust Bowl years of the 1930s.

In response to the Great Depression, President Franklin Roosevelt's New Deal included creation of the National Resources Planning Board, Soil Conservation Service, and Civilian Conservation Corps.

Important Supreme Court Decisions:

Village of Euclid, OH, v. Amber Realty Co. (1926) – The Euclid case revolved around using zoning to protect single-family detached housing from incursions by multifamily housing and industrial uses. Proponents in the case argued that zoning protected property rights by excluding incompatible and nuisance uses and that the public benefited through increased property taxes. Opponents argued that the zoning restricted industry and private commerce. The court found that zoning could be used to protect both "morally desirable" detached residential housing and orderly development. However, by segregating single-family housing from multifamily housing and the working class, the decision has been criticized as supporting class, racial, and immigrant bias.

Pennsylvania Coal v. Mahon (1922) – The regulatory "takings" doctrine that emerged from this decision continues today. The court noted that, as a general rule, "while property may be regulated to a certain extent, if regulation goes too far it will be recognized as a taking." Exactly what constitutes "too far" has never been clearly defined and differs from municipality to municipality, depending on development and growth pressures, public sentiment, and other factors.

Post War: The "Scatteration" of Suburbia

After World War II, the rebuilding of long-neglected American cities and the housing boom of the new "Levittown" style of suburbia were promoted as a means of national economic stimulus. Federal involvement in planning increased. Federal policy and funding supported suburban housing development with new highways, water, electricity, and other infrastructure projects; and addressed the physical and economic deterioration of American cities.

In 1949, Congress authorized Federal funding for urban "redevelopment." In 1954, the Federal Housing Act established and funded urban planning and renewal. Known as the "701 Program" for the Act's section that authorized urban planning assistance, the program provided many cities with the funding to complete their first city plans. These plans were a requirement for Federal urban redevelopment funds. As a result, the greatest amount of urban redevelopment and renewal since the grand plans of the City Beautiful movement was completed from Philadelphia's Society Hill to Chavez Ravine in Los Angeles.

The 1956 Federal Highway Act allocated major funding for acquiring private property through eminent domain and developing the Nation's highways. Although highway systems were seen by many as a way to increase mobility, commerce, and safety, some believed they destroyed and separated communities, facilitated suburban sprawl, and increased society's dependence on the automobile and oil. In addition, some critics decried both urban renewal and highway construction as large-scale government intervention that served elites and the upper class at the expense of African-American and other disadvantaged city neighborhoods. The urban riots of the 1960s heightened concerns about planned freeways that divided cities and the wisdom of urban renewal overall.

President Dwight D. Eisenhower signed the 1956 Federal Highway Act into law. (Photo: Courtesy of the U.S. Department of Transportation Federal Highway Administration)

The Environmental Movement: A Major Era in American Planning

In the 1960s and early '70s, a century of gradually increasing public and private support for the environment came to fruition. The early plans and designs of Lewis Mumford, Clarence Stein, and Benton MacKaye; the GIS and design-with-nature work of Ian MacHarg; and the environmental writings of authors Rachel Carlson, Aldo Leopold, and Edward Abbey all played important roles. Fueled by dire concerns over air and water pollution, major developments such as the Hudson River electric generating dam at Storm King Mountain, continued urban development and sprawl, the Santa Barbara oil spill, and continued undervaluing of natural resources in decisionmaking, the environmental movement was born on April 22, 1970, the first Earth Day.

Earth Day flag designed by John McConnell.

In the early 1970s, President Richard Nixon enacted the most sweeping environmental legislation of all time, providing not only command-and-control regulations, but also funding and technical assistance to clean up the country. The National Environmental Policy Act (NEPA) mandated that environmental impact assessments be completed for Federal policies and projects that might alter or affect environmental quality. The Clean Water Act established the National Pollution Discharge Elimination System and provided $150 billion for upgrading sewage treatment plants. Through State legislation such as the 1970 California Environmental Quality Act, States began to require that environmental and social impact reports be completed for subdivision and other development, and that local comprehensive plans consider air, water, coasts, and natural resources. Together, this Federal and State legislation translated into important action at the local municipal level to consider open space, steep slopes, and riparian areas in municipal comprehensive plans and zoning ordinances.

With the environmental movement of the 1970s, a changing view of private property rights emerged. Private property was seen not only as an avenue for speculation and private commodity, but as a shared community resource. Environmental planning supported the concept that individual property rights must be balanced with the rights of the larger community. This philosophy spurred rethinking about how to develop private property within a framework of plans and regulations that protect environmental and natural systems.

1980 – 2010: Too Much Government?

In 1987, the Montreal Protocol was ratified to address the control of chemicals threatening the ozone layer. This international effort, along with additional cap-and-trade policies and the Santiago Agreement that provided criteria for sustainability, reflected deep concerns about human actions causing environmental risk and degradation. Arguments about global warming, severe weather, and the acidification of oceans, often polarized along political lines, placed global environmental issues in the news.

In America, large-scale suburban development continued in places like Irvine, CA, and Fulton County, Georgia. In addition to major development within driving distance of cities, attractive rural places such as the Bitterroot Valley in Montana were also under development pressure by retiring Baby Boomers. Rural development was also supported by the major commercial disinvestment of forest lands, such as the St. Joe Company's 585,000 acres of forest holdings in the Florida Panhandle.

Private Property: An Important Planning Theme

Private property is a bundle of development, water, mineral, agricultural, and other rights that can be sold, leased, and in some cases regulated by the State. The restriction of private property rights is a theme in the history of planning. Over the last 100 years, planning's influence on private property has been viewed in different ways: as a way to secure property rights for the influential, as an intrusive regulatory power of government, or as policy that protects and enhances both private and community rights.

Police power is the government's authority to protect the health, safety, welfare, and morals of all people. It is the fundamental authority of government to regulate the use of private property through zoning and other ordinances. Entwined with the use of police power is a concern about whether and to what extent regulation should interfere with private property rights. This is the "takings" issue—a challenge to the validity of land use regulation that goes too far and results in the confiscation of private property without hearing or compensation.

Together, suburban sprawl and rural development helped create a new landscape in America: the urban-rural or urban-wildland interface. This landscape has been viewed by some as a landscape of conflict in recreation and land use between newcomers and original residents and between fire and people. The development of the urban-wildland interface caused a growing recognition of the connection between land use planning and wildland fire protection. Organizations like the Tahoe Regional Planning Agency's Bi-State Fire Commission reduced the threat of fire by considering fire risk and behavior in comprehensive plans. They included fire protection in landscape, zoning, and building codes and ensured that subdivision and other plans were reviewed by fire protection agencies.

Suburban sprawl and rural development created a new landscape in America—the urban-wildland interface.

This era's growth and development advanced planning in a number of ways, including support for the planning and acquisition of major open space systems in growing places such as Boulder, CO, and Thousand Oaks, CA; further use of municipal zoning to protect riparian areas, steep slopes, and other natural features; the creation of planning departments in rural places where they had not existed before; and a concentration on planning and regulatory policy that preserved forests and forest production.

Despite the advent of Smart Growth and New Urbanism policies, which encourage economic growth that is energy efficient, pedestrian friendly, and protects the environment during development, there has been a growing backlash supported by industry and political groups against environmental and other regulation in the United States. These groups argue that regulations go too far in restricting private property and commerce, and recent administrations have rolled back some Federal environmental regulations. Legislation and court rulings such as ballot measures 7 and 37 in Oregon, which overturned the State's Comprehensive Land Use Planning Program, have raised questions about the political viability and public support of environmental and other land use regulations.

Today and Tomorrow

The challenges for planning today are many:

- The ability to provide public services in a poor economy
- The continued tension between the restriction of private property and the promotion of societal good
- The costs and conflicts of continued suburban and rural sprawl
- Concerns about small-scale planning and the ability of planning to work in a system of fragmented municipal governments
- Concerns over outdated zoning and development ordinances that do not allow flexibility and ingenuity
- The growth of NIMBY (Not In My Back Yard) attitudes demonstrated by difficulties in moving needed projects and improvements ahead, including the placing of and access to greenways and open space.

Some fear the demise of environmentalism in the face of firm control by national and global industry. Despite all of that, however, many municipalities faced with growth and development continue to provide excellent planning and regulation. This includes the current trend toward support for "green infrastructure," which seeks to use vegetation and open space to take the burden off the traditional "grey" infrastructure of pipes and treatment plants while providing many other environmental services at the same time.

Green infrastructure uses vegetation and open space to help ease stormwater pressure on the traditional grey infrastructure of pipes and treatment plants. (Photo: http://water.epa.gov)

The anticipated growth in the U.S. population to 392 million people by 2050 has led to greater concerns about sustainability. Smart growth approaches to planning demonstrate the use of increased greenspace, energy conservation, compact development, multiple-use development, regional planning, urban renewal and revitalization, traditional neighborhood design, stricter development standards, and improved walkability and public transit. Stormwater water quality and availability will likely become major drivers of environmental planning that encourage the use of clustered development and other Low Impact Development techniques. There will likely be increased planning for housing and services to suit an aging populations and larger ethnic populations. In addition, the role of nonprofit organizations and conservancies in providing recreation and conservation services may continue to grow in importance.

The ever-growing recognition of the profound impact of human actions on the global environment may lead to environmental and other planning at national and multinational scales. The development of a societal land ethic described by Aldo Leopold in the 1940s may be necessary for any meaningful conservation movement. This includes a deep emotional connection of people with nature, which may be more and more difficult in the future with a growing separation of children and nature.

The development of a deep emotional connection of people with nature may be more and more difficult in the future with a growing separation of children and nature.

The Debate over Regional Planning

Led by cultural historian Lewis Mumford, the Regional Planning Association of America was formed in the 1920s. Its members combined ideas from the Garden City movement with conservation of natural resources and wilderness to promote regional ecological planning. Although concerns about the lack of regional planning and the predominance of small-scale and fractured municipal planning continue today, there are some notable examples of regional planning success including the Tahoe Regional Planning Agency in 1969, the Adirondack Park Agency in 1971, and the New Jersey Highlands Water Protection and Planning Act of 2004.

Long Pond in the Saint Regis Canoe Area, New York Forest Preserve. (Photo: http://en.wikipedia.org)

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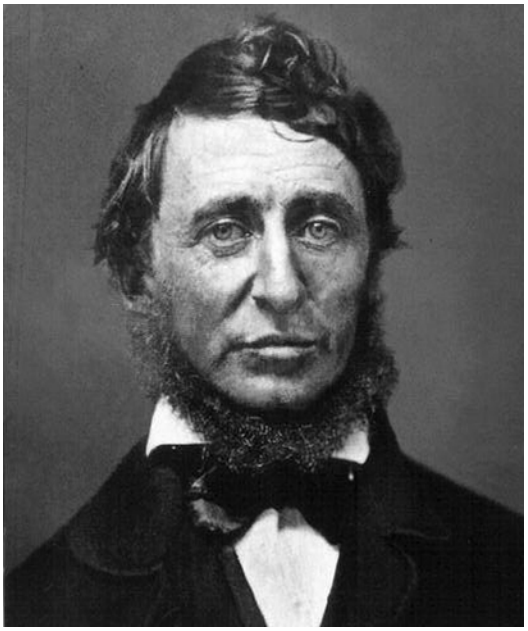

Philosopher Henry David Thoreau, 1856, contributed to the beginning of the environmental movement in the United States. (Photo: The Thoreau Society Collection at the Thoreau Institute at Walden)

Overview

There are a number of State and Federal policies, regulations, and agencies that provide for the protection and use of natural resources. Environmental review and regulation occur at all levels of government. Congress sets policy and develops standards that it directs States to implement and enforce. Environmental review is most often triggered by development or other impacts on natural resources. The type of resource being impacted (water, soil, vegetation, or wildlife) generally dictates the type of review and potential permit necessary for the planned activity. Review and/or permitting activities are also triggered by Federal funding or applicable Federal regulations (for example, federally regulated industries such as telecommunications and energy). Agencies share responsibilities for implementation and oversight.

The History of Environmental Policies

The environmental movement in America began with philosophers and thinkers like Henry Thoreau and John Muir as well as conservationists such as Theodore Roosevelt and Gifford Pinchot. President Roosevelt was the first to use Federal statutes in an effort to shield citizens from the negative impacts of unchecked progress. Railroads, public utilities, and large-scale businesses were the first to be placed under regulation by the newly created Federal Commission, the predecessor to today's regulatory agencies. Regulations to control the quality of food, drinking water, and sewage treatment soon followed.

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The U.S. Postal Service issued a 6-cent stamp series in 1970 in honor of the environmental movement.

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As the Nation's progress continued during the twentieth century, the need for legal and scientific environmental standards became more evident. Several important modern environmental laws were enacted in the 1960s, culminating in the passage of the National Environmental Policy Act (NEPA) in 1970. NEPA was the first major legislation that provided a clear mandate for all Federal agencies to create and maintain conditions that balance man and nature. The environmental movement continued to gain momentum with additional legislation and amendments in the 1980s and 1990s, including amendments in 1990 that strengthened and extended the Clean Air Act.

Following passage of national environmental laws, it was left to the States to enforce environmental policies and provide regulatory authority. The States' role in environmental policy has increased to include most aspects of waste management, groundwater protection, land use management, transportation, and electricity regulation. States also have the opportunity to oversee implementation and develop stricter standards for air pollution control and pesticide regulation.

Federal Laws, Regulations, and Principal Agencies

Environmental Protection Agency (EPA)

The EPA's mission is to protect human health and the environment. EPA is responsible for writing and enforcing regulations and setting national standards for several environmental laws. EPA is responsible for implementing the following primary environmental laws:

The Clean Water Act was enacted to maintain the integrity of wetlands. (Photo: Robert H. Pos, U.S. Fish and Wildlife Service)

The Clean Air Act defines EPA's responsibilities for protecting the Nation's air quality. (Photo: U.S. Fish and Wildlife Service)

Clean Water Act (CWA) – Defines EPA's responsibilities for restoring and maintaining the chemical, physical, and biological integrity of U.S. waters. It is implemented by States through a variety of programs aimed at preventing point and nonpoint pollution sources, assisting publicly owned water treatment works, and maintaining the integrity of wetlands .

National Environmental Policy Act (NEPA) – Defines the responsibility of Federal agencies, regulated industries, and funding recipients for integrating environmental values into their decisionmaking processes. Federal agencies are required to conduct environmental reviews prior to implementing new programs or making changes to existing programs.

Clean Air Act (CAA) – Defines EPA's responsibilities for protecting and improving the Nation's air quality and addressing the ozone layer. It is put into practice through State Implementation Plans developed by each State.

Resource Conservation and Recovery Act (RCRA) – Defines EPA's responsibility for controlling hazardous waste from the "cradle to grave" and provides a framework for managing nonhazardous solid wastes. The EPA or States require permitting for companies that manage solid or hazardous wastes. Although RCRA is a Federal statute, many States carry out the program.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) – Commonly known as Superfund, the CERCLA defines EPA's responsibility for providing Federal responses to releases or threatened releases of hazardous substances that may endanger public health or the environment.

The passage of NEPA in 1970 provided a national policy that encouraged a productive and harmonious coexistence between man and the environment.

Environmental Policy Timeline

1963—>Clean Air Act
1964—>Wilderness Act
1966—>Endangered Species Preservation Act
1970—>National Environmental Policy Act, Resource Conservation and Recovery Act
1972—>Federal Water Pollution Control Act, Federal Environmental Pesticide Control Act, Ocean Dumping Act, Coastal Zone Management Act
1980—>Comprehensive Environmental Response, Compensation, and Liability Act

Safe Drinking Water Act (SDWA) – Defines EPA's responsibility for setting national health-based standards for drinking water quality and overseeing the State, locality, and private water suppliers who implement those standards.

Toxic Substances Control Act (TSCA) – Defines EPA's responsibility for requiring reporting, record keeping, testing, and restrictions related to chemical substances and/or mixtures.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) – Defines EPA's responsibility for controlling pesticide distribution, sale, and use. All pesticides used in the United States must be registered by EPA.

The Safe Drinking Water Act defines the EPA's responsibility for setting national standards for drinking water quality.

Federal Emergency Management Agency (FEMA)

FEMA's mission is to build, sustain, and improve the Nation's capability to prepare for, protect against, respond to, recover from, and mitigate all hazards. FEMA is part of the U.S. Department of Homeland Security and is responsible for providing Federal response to disasters.

Robert T. Stafford Disaster Relief and Emergency Act (Stafford Act) – Defines FEMA's responsibility for overseeing State and local disaster response activities, including preparedness, risk assessment, floodplain management, and integrating hazard mitigation into comprehensive planning.

National Oceanic and Atmospheric Administration (NOAA)

NOAA's mission is to protect life and property and conserve and protect natural resources through science, service, and stewardship. NOAA's products and services range from weather forecasting and climate monitoring to fisheries management, coastal restoration, and support of marine commerce.

FEMA is responsible for providing Federal response to disasters such as Hurricane Katrina.

Coastal Zone Management Act (CZMA) – Defines NOAA's and EPA's responsibility for encouraging applicable States to voluntarily develop and implement a comprehensive coastal management program that preserves, protects, develops, and where possible, restores or enhances valuable natural coastal resources. Federal financial assistance is available to States that participate.

U.S. Fish and Wildlife Service (USFWS)

The U.S. Fish and Wildlife Service is a bureau within the U.S. Department of the Interior whose mission is to conserve, protect, and enhance the Nation's fish, wildlife, and plant resources, and their habitats. The USFWS is responsible for enforcing Federal wildlife laws, protecting endangered species, managing migratory birds , restoring nationally significant fisheries, conserving and restoring wildlife habitats, assisting with international conservation efforts, and distributing Federal funding to State fish and wildlife agencies through various programs, including the Wildlife Sport Fish Restoration program.

The U.S. Fish and Wildlife Service manages migratory birds, among other responsibilities. (Photo: Gary Kramer, U.S. Fish and Wildlife Service)

Endangered Species Act (ESA) – Defines the responsibilities of the USFWS and NOAA for providing a program for conserving threatened and endangered plants and animals and the habitats in which they are found. Critical habitat is designated for each species, and actions within the critical habitat areas are regulated at the State level.

The Lacey Act – Defines the responsibility of the USFWS, NOAA, and the USDA for prohibiting trade in wildlife, fish, and plants that have been illegally taken, possessed, transported, or sold. Enforcement occurs at inspection stations and border crossings.

U.S. Department of Agriculture (USDA)

The mission of the USDA is to provide leadership for the Nation's food supply, agriculture, and natural resources. The Agency utilizes sound public policy, science, and management to provide an integrated and responsive program. The USDA provides oversight for numerous Federal agencies, including the U.S. Forest Service and the Natural Resources Conservation Service, that are responsible for providing USDA natural resource programs and services.

Food, Conservation, and Energy Act of 2008 (Farm Bill) – Executive Order that defines the USDA's responsibilities for governing the bulk of Federal agriculture and related programs for the next 4 years. It addresses commodities, resource conservation, nutrition, credit, rural development, research, forestry, energy, horticulture and organic agriculture, livestock, crop insurance, commodity futures, trade, and taxes.

Noxious Weeds and Invasive Plants - Executive Order 13112 – Defines invasive species as "...an alien (or non-native) species whose introduction does, or is likely to, cause economic or environmental harm or harm to human health." This Executive Order created the National Invasive Species Council, which coordinates interagency resources for invasive species management.

U.S. Forest Service

The U.S. Forest Service is an agency of the USDA that is responsible for stewardship and management of public lands in national forests and grasslands. The mission of the Forest Service is to sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations. In addition to resource management, the Forest Service is authorized to provide technical and financial assistance to the public.

National Forest Management Act of 1976 (NFMA) – Authorizes the Forest Service to provide long-range planning to ensure the future supply of forest resources while maintaining a quality natural environment. This is implemented by the Forest Service through periodic, renewable resource assessments.

Cooperative Forestry Assistance Act of 1978 – As amended, authorizes the Forest Stewardship Program, Urban and Community Forestry Program, and the Forest Legacy Program to provide technical assistance, through State forestry agency partners, to nonindustrial private forest owners that encourages and enables active, long-term forest management.

Healthy Forests Restoration Act (HFRA) – Contains a variety of provisions to expedite hazardous fuel reduction and forest restoration projects on specific types of Federal land that are at risk of wildland fire or insect and disease epidemics.

National Fire Plan of 2000 (NFP) – A response to the HFRA, the NFP defines the U.S. Forest Service and Department of the Interior's responsibility for responding to severe wildland fires , reducing their impacts on communities, and ensuring sufficient future firefighting capabilities.

The U.S. Forest Service is responsible for sustaining the health, diversity, and productivity of the Nation's forests and grasslands.

States play a prominent role in every area of environmental policy, collectively issuing a majority of all environmental permits and enforcement actions for which they receive very little funding.

State Policies, Regulations, and Agency Authority

Responsibility for carrying out and enforcing Federal policies, standards, and regulations is generally directed to State agencies or departments within four specific areas: agriculture, environmental protection, natural resources, and emergency management or public safety. States may further divide the responsibility for natural resources among additional departments.

The National Fire Plan of 2000 defines Federal agency responsibility for responding to severe wildland fires.

Successful Legislation

Examples of successful planning and policies include the following:

- Land Use and Development Planning – Vermont Act 250: http://energy.gov/savings/vermont-land-use-and-development-act-250-vermont
- No Net Loss – New Jersey's No Net Loss Reforestation Act: http://www.state.nj.us/dep/parksandforests/forest/community/No_Net_Loss.htm
- Forest Conservation – Maryland's Forest Conservation Act: http://www.dnr.state.md.us/forests/programapps/newFCA.asp

Agriculture

Each State Department of Agriculture is responsible for setting agricultural policies, enforcing regulations, and providing assistance to agricultural producers. Additional responsibilities may include consumer protection, public health, environmental advocacy, agricultural marketing, and public information and awareness. Many States also have a State Plant Board that assists in these efforts.

Environmental Protection

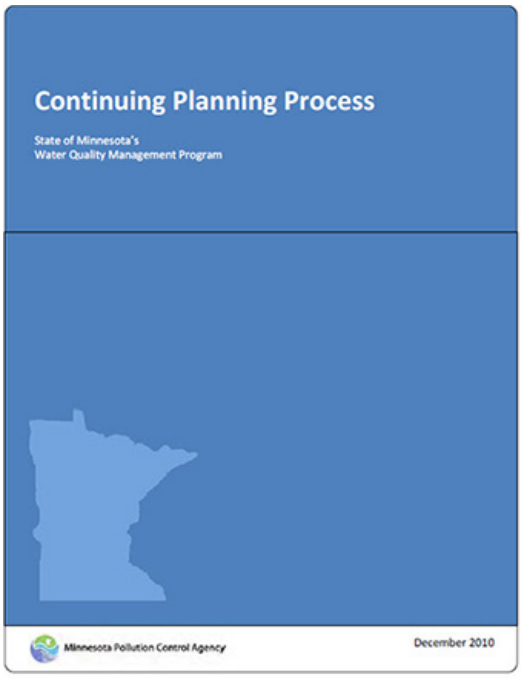
The EPA directs each State to implement and enforce standards and regulations related to environmental quality, energy, soil and water conservation, and water resources. The primary goal is to improve the quality of air, water, and soil resources for their sustainable use. At the State level, the two most prominent objectives are protection of water resources and soil and water conservation.

The EPA authorizes States to take responsibility for watershed management and the monitoring, laws, rules, standards, financial assistance, permits, engineering, compliance, and enforcement for all public drinking water and water pollution control efforts. The Clean Water Act requires States to produce a Continuing Planning Process (CPP) document that provides the State's strategies for water quality planning and management.

To see Minnesota's CPP, go to http://www.pca.state.mn.us/index.php/view-document.html?gid=15647.

Water pollution degrades streams, rivers, and lakes, making the water unsafe for drinking, swimming, or fishing. The Clean Water Act authorizes the protection of water resources from pollution through the National Pollutant Discharge Elimination System (NPDES) permit program, which controls water pollution by regulating point and nonpoint sources that discharge pollution into waters of the United States. Other Federal laws that relate to the NPDES program include the Endangered Species Act, National Environmental Policy Act, and the Coastal Zone Management Act. State agencies are responsible for implementation, compliance, and enforcement of the EPA's regulations and standards, including stormwater management, best management practices, and sediment and erosion control.

For an innovative approach to stormwater management in Lenexa, KS, go to http://www.lenexa.com/raintorecreation/index.html.



Minnesota Continuing Planning Process document cover.

The award-winning Lake Lenexa dam manages stormwater and provides recreational opportunities in Lake Lenexa, Kansas. (Photo: http://www.lenexa.com/Assets/departments/raintorecreation/pdfs/project_lakelenexa.pdf)

Natural Resources

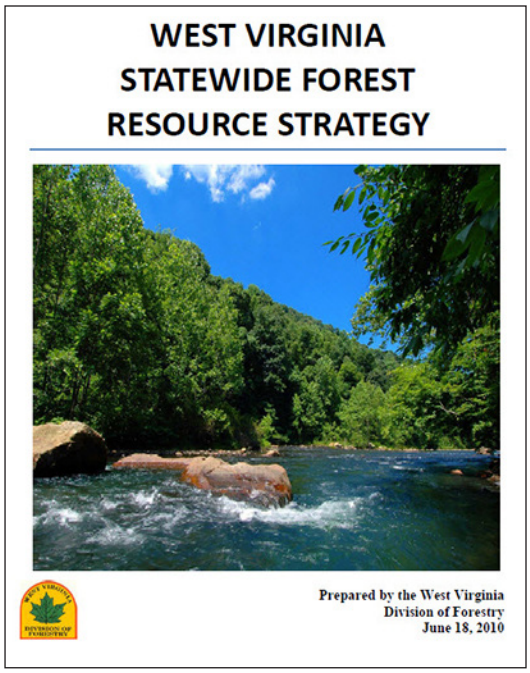
Managing and protecting fish, forest, and wildlife resources is generally under the purview of State natural resource or conservation departments. These agencies also provide opportunities for all citizens to learn about, enjoy, and use these resources. They facilitate the public's participation in resource management. To read about a comprehensive approach to conservation, go to the Highlands Conservation Act at http://www.highlandscampaign.org/conservation-act.

The 2008 Farm Bill laid the foundation for State natural resource agencies and conservation departments to use their programs to benefit forestry and wildlife. This bill required States to complete a Statewide Forest Resource Assessment and Strategy (now called a State Forest Action Plan) that analyzes forest conditions and trends and delineates priority rural and urban forest landscape areas and issues.

View example Forest Action Plans at http://forestactionplans.org.

Emergency Management and Public Safety

Many States have a Department of Public Safety or Homeland Security that is responsible for emergency management and public safety, including fire safety. Programs within these departments provide support services and resources to help local law enforcement agencies. State and local emergency management officials coordinate with FEMA's regional offices to protect against, respond to, recover from, and mitigate all natural and manmade hazards. Many State resource agencies also coordinate with FEMA and their Department of Public Safety to provide wildfire management.



The 2008 Farm Bill required States to assess their forest resources and develop a prioritized statewide strategy for managing them.

Relevant Factsheets

P1 – *An American History of Planning* – Provides background on how and why policies have been developed.

L2 – *Scales of Planning: From Landscapes to Ecosystems* – Provides an understanding of policy use at different planning scales.

N3 – *Regulatory Approaches to Protecting Natural Resources* – Provides additional information on regulations for resource protection.

N6 – *Planning Tools to Protect Water Quality* – Provides the regulatory background to policies communities must implement and follow.

Resources

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Changing Landscapes

Land use planning curriculum for natural resource professionals

P rinciples, people, and policies
L and planning and pressures
A pproaches
N atural resource planning tools

P3: The Role of the Natural Resource Professional in Planning

Natural resource professionals can help citizens understand ecological processes.

Overview

This factsheet emphasizes the role of natural resource professionals in planning. It provides easy-to-understand suggestions on how to integrate their expertise into the process, address conflicts, and target messages while using the best available science.

The Need for Participation

Policymakers, elected officials, and nongovernmental organizations are increasingly requesting that natural resource professionals become involved in planning to address rapidly changing issues related to the environment. The primary role of resource professionals in the planning process is usually as a science-based advocate. However, there are other ways to effectively help. They can:

- Help citizens understand ecological processes
- Initiate communication with planners and developers
- Conduct environmental outreach
- Integrate stakeholders into natural resource decisionmaking

To advance the role of science in planning, it is critical that natural resource professionals effectively communicate with nonscientific audiences. While resource professionals generally understand the need for communicating scientific information to the public, they may not know when or how this should be done. They also need to be familiar with ways to include others in planning.

If resource professionals want to motivate, enable, and sustain public action, it is critical that they frame environmental issues in ways that communicate what is at stake for society and why the issues matter. Doing this helps the public better recognize the relevance of problems to their everyday lives and specific values. Framing issues provides common points of reference and meaning, and helps simplify complex interactions.

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Science-based Advocacy

The interrelationship of policy and science can be highly situational and may not be based solely on providing scientific knowledge to improve policy decisions. However, resource professionals acting as science-based advocates can call attention to relevant scientific information. They can ensure, to the extent possible, that policies and implementation are consistent with the best available science.

Resource professionals are familiar with using best management practices for managing ecosystems. Meyer and others (2010) have developed best management practices for advocacy that include:

- Accurately characterizing the best available, policy-relevant science
- Clearly and thoroughly presenting the argument
- Accurately characterizing scientific uncertainty
- Transparently representing the scientific basis for policy recommendations and explicitly acknowledging the values that influence these recommendations
- Avoiding overstatement and acknowledging when providing personal rather than professional opinions or recommendations
- Demonstrating a willingness to revise policy recommendations based upon new information

Although the natural resource professional has traditionally provided specialized knowledge during planning, there is a new trend emerging: integrating the expertise of natural resource professionals with that of other disciplines to create interdisciplinary collaboration and communication. Ecosystem stewardship is an example of an interdisciplinary framework that involves ongoing reassessment and involvement in the policy process as well as continuously interacting with stakeholders.

There is a new trend emerging: integrating the expertise of natural resource professionals with that of other disciplines to create interdisciplinary collaboration and communication.

Getting Involved

There are a number of ways that natural resource professionals can become involved. They need to be proactive and get involved early. They shouldn't wait to address an issue until it is in front of the Planning and Zoning Commission; at this point, it is usually too late.

Building relationships with policymakers, elected officials, stakeholders, and advocacy organizations provides an opportunity for ongoing communication and interaction unhindered by conflict. Becoming involved in the planning process early helps planners and others place environmental issues and concerns in perspective with other issues and desired planning goals and objectives. Natural resource professionals can work with governmental and citizen organizations, including:

Governmental Organizations

- Community and County Planning Staff
- Metropolitan and Regional Planning Organizations or Councils of Government
- Community Task Forces and Steering Committees
- Lake, Sewer, Watershed, or Levee Districts
- Parks and Recreation Departments

Citizen Organizations

- Audubon Society and other Outdoor-oriented Clubs
- Watershed Associations and Stream Teams
- Garden and Local Horticultural Clubs
- Community Recreation Organizations

Engaging the public has several benefits. It brings people together to solve problems, establishes communication between diverse groups, and helps people find a solution to those problems. When a diverse group of people is part of a decisionmaking process, it builds their sense of ownership in the solution and eases the implementation process.

Natural resource professionals can engage the public by working with small discussion groups.

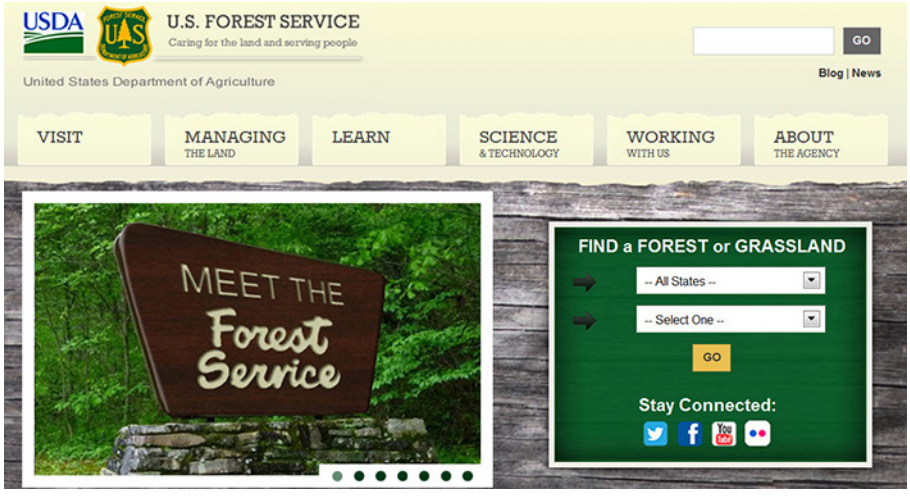
Engagement can range from working with small local groups and projects to larger regional initiatives. Engaging a community can take a number of forms—working with planning staff to develop a natural resource inventory or, at a minimum, a tree inventory; providing input to lake districts and sewerage districts about the impacts of development on select natural resources; serving as a member on task forces or community boards; or working with citizen groups to protect and manage resources from rain gardens to natural areas.

Getting the Word Out

People learn about ecosystems and the environment from a variety of sources—television, the Internet, other media sources, science centers, and museums, among others. Effective communication strategies and education efforts use a combination of technologies and methods. This makes messages relevant, creates interest, provides resources, engages stakeholders, and maintains relationships. Communication efforts should be tailored to an audience's background, interests, and ability to assimilate information. If resource professionals do not have access to media specialists within their organizations to help get the word out, they will need to take the initiative to build relationships with media resources within their communities.

Given the high-tech nature of today's society, it is critical to use the Internet to inform a broader group of interested people. Most communities have a Web site that provides information about community events and links to important information. Resource professionals can provide content and links to natural resource sites to help communities get information out to people interested in the natural resources of their own community and/or region.

It is critical to use the Internet to inform a broader group of interested people.

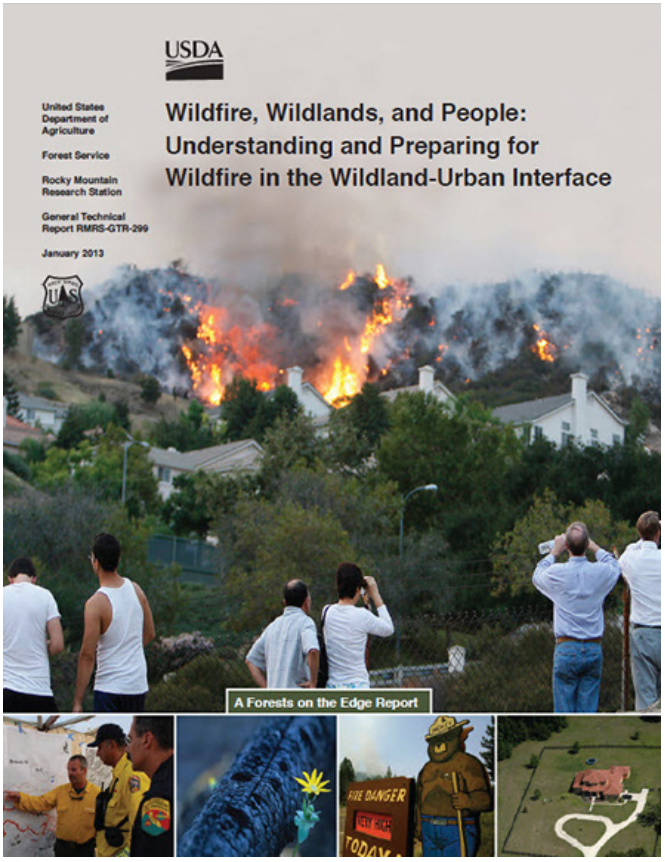


The Web site for the Forest Service, U.S. Department of Agriculture, provides a variety of links to natural-resource based information. (Photo: http://www.fs.fed.us)

Case Study — Forests on the Edge – Housing Development on America's Private Forests

The goal of the *Forests on the Edge* project is twofold: 1) increase public understanding of the processes and thresholds associated with higher housing densities in private forests across watersheds, and 2) create new tools for strategic planning. Conversion of forest land to developed land is inevitable. However, local communities and States can target efforts to prevent or reduce conversion of the most valuable tracts to maintain functionally resilient and productive forest lands. The project is using an interdisciplinary team and geographic information system techniques to identify fourth-level watersheds that are projected to be impacted by development in the next 20 years.

For more information, go to http://www.fs.fed.us/openspace/fote/index.html.


USDA
United States Department of Agriculture
Forest Service
Rocky Mountain Research Station
General Technical Report RMRS-GTR-299
January 2013
Wildfire, Wildlands, and People: Understanding and Preparing for Wildfire in the Wildland-Urban Interface
A Forests on the Edge Report

The **Forests on the Edge** *project completed this report in January 2013.*

Relevant Factsheets

P2 – *Policies that Direct Natural Resource Planning* – Provides an overview of regulations that affect natural resources.

L3 – *How Planning is Put into Practice* – Describes the fundamental elements of planning and why communities plan.

L4 – *The Power of Collaboration in Community Planning* – Provides additional resources to professionals on how they can affect planning.

L5 – *Participation with Conflict in Mind* – Provides recommendations on using participation and conflict resolution to facilitate proactive dialogue in planning.

A4 – *Using Science to Substantiate Natural Resource Planning* – Provides scientific information in support of policy recommendations.

N4 – *Nonregulatory Approaches to Natural Resource Conservation* – Provides resources on nonregulatory methods, which are often easier to establish in a timelier manner than policies.

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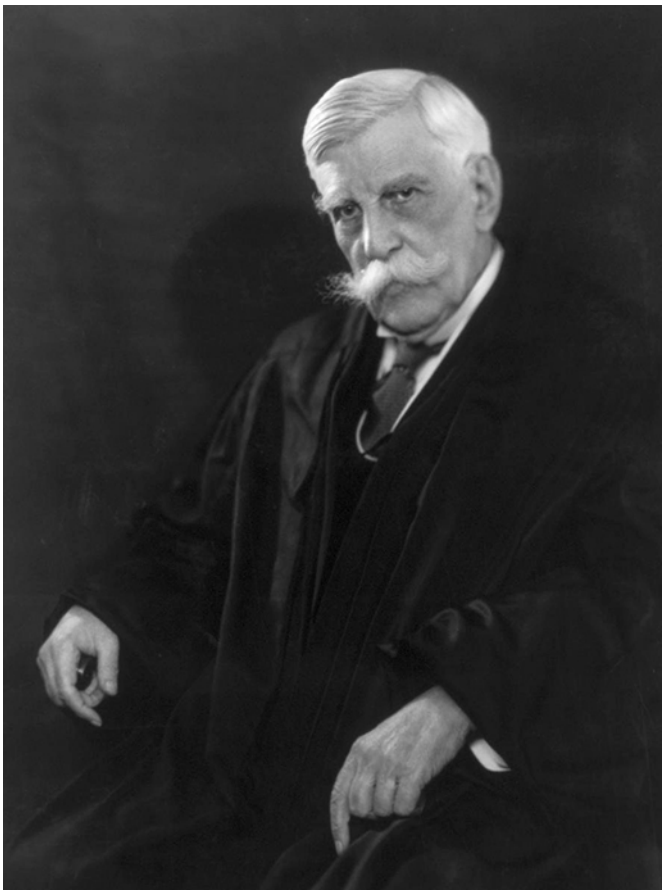
P4: Developing and Measuring Effective Local Policy



United States Supreme Court Justice Oliver Wendell Holmes, Jr., wrote in 1922 that "while property may be regulated to a certain extent, if regulation goes too far it will be recognized as a taking." (Photo: http://en.wikipedia.org)

Overview

This factsheet discusses the concept of policy, how it is created in local government, and how it can be evaluated for success or failure. The factsheet presents a brief overview of policies related to managing urban trees and fire. It uses these examples to show how policy can be effective drivers of change.

Definition and Development of Policy

Policy can be defined as something that "displays, makes known." Policy is a principle, plan, or course of action pursued by a government, organization, or individual. Public policy can be formal, legal, and binding—as in the case of a municipal zoning ordinance that protects native trees from being removed during development. However, public policy can also be more subtle, such as the will of a city council and how its members vote on certain issues.

"Police power" is what gives municipalities the authority to enact and enforce zoning ordinances and other policies. It is based on the authority and responsibility of government to protect the health, safety, welfare, and morals of all people. If police power is used unjustly, a property owner can seek relief in court on the basis of a "taking of private property." A taking is not a legal action. It is a problem of government overregulation that goes so far as to result in confiscation of private property without payment of compensation or due process. U.S. Supreme Court Justice Oliver Wendell Holmes in *Pennsylvania Coal Mine* v. *Mahon 260* (1922) wrote, "The general rule at least is, that while property may be regulated to a certain extent, if regulation goes too far it will be recognized as a taking." Today, too far continues to be evaluated on a case-by-case basis. All States in the United States provide municipalities the authority at some level to enact, amend, and enforce zoning and other ordinances through State

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municipal codes and special legislation, such as State planning codes, building codes, and safety codes.

Municipalities are commonly authorized by the State to create policy using a number of regulatory and nonregulatory tools. These are some of the common tools that municipalities use:

- Comprehensive Plans (sometimes known as General, Master, or Development Plans) guide future growth and development. Elements (chapters) of comprehensive plans direct future growth and development, land use, transportation, housing, capital budgeting, and natural resource conservation. These plans provide the logical nexus for the use of ordinances and other police power.
- Zoning, subdivision, land development, and other ordinances provide requirements for the type, density, and location of land use and the design and application requirements of subdivision and other development.
- Resolutions passed by a governing body in support of certain actions or organizations such as a volunteer effort.
- Decisions and prevailing philosophy of elected officials.

Public policy can be flexible and often changes as elected officials change, as citizen demographics shift, as a result of court decisions, or when conflict mandates policy change. Conflict over economic, social, and environmental issues associated with growth and development is often a driver of ordinances and policy change. A benefit of expressing policy in zoning or other ordinances is a certain degree of stability. Formal procedures to enact or amend zoning and other ordinances, including a review by planning commissions, review by county or other agencies, noticed public hearing, citizen review, and voting, can make enacted ordinances more difficult to change when there is a change in elected officials and their administrations.

Conflict over economic, social, and environmental issues associated with growth and development is often a driver of ordinances and policy change.

Community Tree Plans: An Example of Public Policy

Many municipalities have developed community tree plans to provide standards and regulations for managing street and park trees. These plans can guide daily and long-term care and budgets. The most common goals of community tree plans are to improve a community's image, pride, and commerce; and increase the quality of and accessibility to a community's natural resources.

Community tree plans can help communities more effectively administer their street tree program, manage risk, and reduce municipal liability. Tree plan objectives often include a requirement for an annual assessment and the removal of hazardous trees, proper species selection, and pruning. Other objectives may involve issues related to funding and community education.

Each objective within the plan has associated strategies. An effective administration strategy might be to provide an annual work plan and budget to elected officials. A possible outreach strategy might call for the tree commission to work with the local paper to ensure that one positive educational article about the commission's work each spring for Arbor Day is published.

Some community tree plans stand alone, while others are incorporated as elements of municipal comprehensive plans. These plans do not need to be long and complicated. The best approach to developing community tree plans is to formulate a clear vision and set realistic goals with concrete objectives, sensible short-term strategies, and measurable criteria for success. It is important to set strategies that can be completed and celebrated.

Although they are not an ideal tool for land use planning, zoning and other municipal ordinances are often reactive—they are adopted in response to citizen outrage about something that has happened or that should have happened. An example is when a developer removes a woodlot that had been used by a neighborhood for walking and other recreation purposes. There may be a strong citizen outcry to elected officials to protect this type of landscape. Often this outcry results in revisions to an existing ordinance or the adoption of a new zoning ordinance that addresses the issue. Municipalities should consider reaction and conflict when developing ordinances. Often it is "borrowed" ordinances that are outdated, incomplete, or even irrelevant that do not withstand controversy. Municipal policy should be locally developed to reflect the values, standards, desires, and abilities of a particular municipality.

When developing ordinances and other policy tools, a municipality should consider the following broad objectives:

- Provide equity for all. Treat small and large landowners alike.
- Be efficient. Provide the most benefit for the cost, including costs borne by developers in following ordinances.
- Strive to achieve a legitimate purpose. Policy tools such as ordinances must be able to demonstrate they have positive impact on public safety, welfare, and health.
- Impede personal liberty as little as possible. Zoning and other ordinances cannot be so stringent that they disallow property owners "reasonable and conforming" use, which is the basis of the "takings" issue.

Most debates over ordinances and other policies boil down to concerns and debates over one of these broad objectives.

The Policy Evaluation and Monitoring Process

Municipalities need to formally evaluate ordinances and other types of policy for technical, economic, and administrative success and carefully monitor them after enactment. To do that, they must identify and clearly state the goals, objectives, criteria, and measures of the policies.

Goals are formal, broadly worded statements that identify what the policy is intended to achieve in the long run.

Objectives are statements that are more focused, timely, and concrete than goals and are more readily achieved. Objectives represent interim targets or milestones toward desired goals and are often short term in nature, perhaps one year in scope.

Strategies are the day-to-day and month-to-month specific actions that will be taken to accomplish objectives.

Criteria are specific standards used to evaluate and monitor objectives and strategies related to a specific policy. Each criterion can have multiple tangible or quantitative measures. In addition, measures can be used to rank and prioritize policy alternatives as well as to evaluate their success. Possible measures include costs, benefits, effectiveness, risk, liability, political viability, administrative ease, equity, and public sentiment. In general, accepted criteria address:

- **Technical feasibility**: Does the ordinance achieve its purpose in a technical sense—that is, will it work?
- **Economic and financial possibility**: What are the benefits and at what cost? Do the benefits outweigh the costs?
- **Political viability**: Is the policy acceptable to decisionmakers, public officials, citizens, and other influential groups?
- **Administrative operability**: Is there authority to carry out the policy? Does staff have the commitment and capability to administer and enforce the policy?

Example of Policy Evaluation or Monitoring Method

The example below shows a logical approach that uses criteria and measures to evaluate the success of a broader policy goal to increase public safety. In this example, public safety is expected to be increased by reducing flooding related to stormwater flow and also by reducing the threat of wildfire. Use a systematic, clear method to evaluate and monitor policy effectiveness.

Goal	Increase public health and safety.	
	Stormwater	**Wildfire**
Objectives	Decrease peak flow volumes.	Decrease damage and destruction of homes and structures.
Strategies	Enact a stormwater ordinance that incorporates Low Impact Development design and other BMPs.	Enact an ordinance that mandates vegetative management using Firewise principles.
Criteria	Reduce peak flow volume. Reduce stormwater management costs to municipality.	Reduce structural damage from wildfire moving into the defensible space of a home.
Measures	Peak flow volumes and annual stormwater management costs.	Number of structures lost or damaged and associated costs.

Urban Forestry Policy

Many communities have forestry ordinances that their local government can enact and enforce to help better care for trees and support tree care programs. Some commonly used ordinances include:

Street Tree Ordinances preserve, protect, and maintain municipal-owned trees along streets and in parks. They often contain a permit process to plant, remove, and maintain public trees.

Shade Tree Commission Ordinances create municipal commissions that are typically responsible for annual work plans, budgeting, volunteer management, and educational efforts that are part of planning and managing street and park trees.

A community forestry ordinance is successful if it improves a community's image, the quality of development, and property values. Other signs of successful ordinances include acceptance by developers and citizens, less conflict, and legal judgments favoring an ordinance.

Street tree ordinances help preserve, protect, and maintain street trees. (Photo: Chesapeake NEMO)

Subdivision and Land Development Ordinances outline the required application materials and development permit review process. They provide for design and construction standards and for the bonding of landscaping, streets, and other public improvements.

Zoning Ordinances restrict the type, density, and location of development. They are often used to protect open space, trees and woodlands, riparian areas, steep slopes, and wetlands during development.

Zoning ordinances and subdivision and land development ordinances are not part of planning per se. They are examples of regulatory tools that can be used to enact a municipality's comprehensive plan. These ordinances often work together. For example, a zoning ordinance would provide for the size of lots and the number of residential units in a subdivision, and a subdivision and land development ordinance would direct how the homes and streets were designed and placed on the parcel. Both would provide the standards and regulations used to evaluate zoning and the subdivision plan during the permit application. For a subdivision or other plan to be approved, or for a grading or other development permit to be issued, the application must conform to existing zoning and ordinances.

Public Involvement in Ordinance Development

Involve all stakeholders—both those who are directly and indirectly affected—in developing ordinances. Involving people in planning and decisionmaking ensures their understanding of the ordinance and boosts overall support and buy-in for the ordinance. Public involvement has repeatedly been shown to decrease the long-term costs of conflict such as higher administration and enforcement costs.

Community forestry ordinances can fail when they:

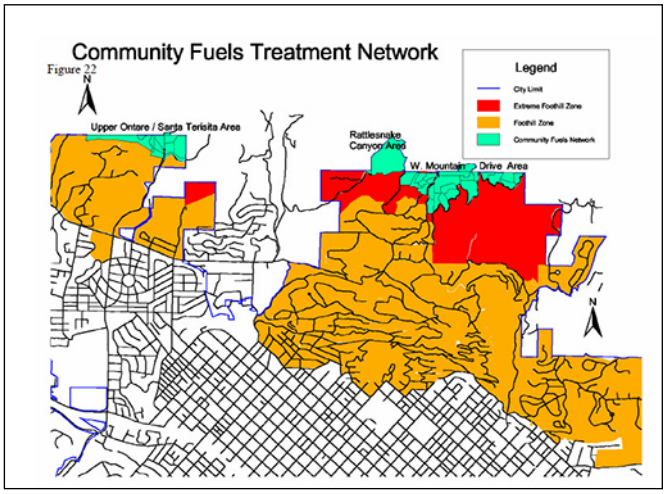
- Are borrowed, rather than locally planned
- Don't include public and business participation
- Don't include an educational component
- Don't have well-defined permitting, review, and appeal processes
- Don't provide technically sound standards
- Are not well administered or enforceable

Involve all stakeholders in developing ordinances.

Case Study — Santa Barbara, CA, Wildland Fire Plan

Mediterranean/chaparral landscapes that are fully stocked and often have dead understory vegetation; steep topography; and compressed, hot, high-velocity winds cause many residential areas of the city of Santa Barbara to be in extreme fire hazard zones. As a result, the city has experienced the Painted Cave, Tea, and other large, destructive fires. These fires have repeatedly destroyed and threatened life, property, natural resources, and the economy.

In an effort to reduce wildland fires, the city council approved the Wildland Fire Plan in 2004. The plan was one of the first in the country and is part of the Safety Element of the city's General/Comprehensive Plan. The Fire Plan has four main chapters: Fire Hazard and Risk Assessment, Values Threatened by Wildland Fire, Fire Hazard and Vegetative Management Zones, and General Fire Protection Strategies.



Map depicting the Santa Barbara Community Fuels Treatment Network. (Map: City of Santa Barbara (CA) Wildland Fire Plan (January 21, 2004))

In addition to the Wildland Fire Plan, the city has adopted other policy. Although this has not been adopted by a zoning ordinance, the city's General Plan discusses using transfer of development rights to move development density out of extreme fire zones. The city's zoning ordinance mandates that larger lots be provided on steeper slopes to provide more fire defensible space. The city's building code mandates certain roof and siding materials, sprinkler systems, and double-paned windows of tempered glass to protect building entries from the tremendous heat of wildfires. The city's landscape ordinance mandates fire department review of all development landscape plans and the planting of vegetation more adaptive to fire-prone landscapes. The long-term removal and maintenance of vegetation and defensible space by homeowners is enforceable under the city ordinance.

One successful program that has resulted from the Wildland Fire Plan is the Community Fuels Treatment Network. This program is funded by a city council-approved Wildland Fire Assessment District tax. The program's goal is to reduce fuels while being environmentally responsible and protecting important hillside views. Using the District's tax funding and grants, the program removes thousands of tons of vegetation annually in an effort to reduce the heat produced by any fire. Vegetative inspections and removals are paid for by the city on both private and public property in an attempt to cover a complicated matrix of private and public properties.

The city's fire policy still faces some opposition to the higher cost of building materials, homeowner disagreements about what vegetation should be removed and planted, and continued opposition to controlled burns because of smoke and other concerns. The most important part of the Wildland Fire Plan is that is takes a comprehensive approach to the entire problem of wildland fire in an urbanized area.

Santa Barbara Wildland Fire Plan: http://www.santabarbaraca.gov/gov/depts/fire/fireplan.asp
Santa Barbara General Plan and Ordinances: http://www.santabarbaraca.gov
National Fire Protection Agency. 2008. 1141 Standard for fire protection infrastructure for land development in suburban and rural areas. Quincy, MA. 35 p.

Relevant Factsheets

N2 – *Comprehensive Planning for Natural Resource Conservation* – Provides an overview of comprehensive planning and discusses some tools that can be used to protect natural resources and develop strong policy.

N3 – *Regulatory Approaches to Protecting Natural Resources* – Discusses zoning subdivision ordinances and presents two examples of legalized public policy.

N4 – *Nonregulatory Approaches to Natural Resource Conservation* – Discusses how nonregulatory tools, such as developer incentives and education, can help effectively manage growth.

Resources

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USDA
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Changing Landscapes

Land use planning curriculum for natural resource professionals

P rinciples, people, and policies
L and planning and pressures
A pproaches
N atural resource planning tools

P5: Principles of Ecosystem Services

Timber harvesting is one of the few ecosystem services that has fully functional markets and prices.
(Photo: http://www.nhstateparks.org/)

Overview

This factsheet provides a basic overview of ecosystem processes, services, and products provided by both rural and urban forests. It discusses how difficulties in estimating the monetary value of carbon sequestration and other ecosystem services impede establishing economic markets and prices. Compensating landowners and others for conserving ecosystem services provides an incentive for landowners that can contribute to better natural resource protection and management.

Environmental Value of Trees and Forests

Trees and other living parts of a forest, such as soils, microorganisms, and wildlife, support healthy forest ecosystems, which provide many benefits now called ecosystem services. These include an array of environmental, economic, health, social, and other benefits. The following illustrate some of the most important ecosystem services typically provided by forests.

Timber and other forest products

Timber harvests are among the few ecosystem services for which there are fully functional markets and prices. In 2011, U.S. Forest Service lands alone yielded about $150 million of timber. This figure does not include the value added as products are manufactured and sold from timber.

Tourism

National parks and Federal lands generate jobs and tourist dollars. Nationwide in 2010, national parks provided some 267,000 private-sector jobs and generated $13.3 billion in economic activity in nearby communities.

Tourism generates both jobs and tourist dollars.

Forest Service
Northeastern Area State and Private Forestry
11 Campus Blvd., Suite 200
Newtown Square, PA 19073
October 2014
http://www.na.fs.fed.us

NA–TP–01–14 P5
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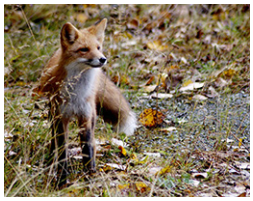
Trees, other plants, and soil help protect water quality.

Clean water

The ability of trees, other plants, and soil to protect water quality was a crucial element in the earliest movements to preserve large areas of forest. In 1855, Philadelphia set aside 7,000 acres of forested land and created Fairmount Park to protect the city's water supply. In 1885, the Adirondack and Catskill Reserves in Upstate New York were established to protect water for New York City residents, far downstream. Water protection and regulation were fundamental reasons for passage of the U.S. Forest Reserve Act of 1891, the precursor to our National Forest System. In fact, two-thirds of the Nation's freshwater supply originates in stream water that is filtered through forests.



Wildlife provides value through many different ecosystem services.

Wildlife

Wildlife provides value through many different ecosystem services including biodiversity, hunting, tourism, observations, or simply our knowledge of their existence. In 2006, the National Wildlife System generated almost $1.7 billion in economic activity for local communities. That same year, hunters, fishers, and wildlife watchers in the United States spent $122.3 billion on those activities. Wildlife also provides critical components of other ecosystem processes such as pollination and seed dispersion.

Maintaining existing forests is considered one of the least expensive options for mitigating climate change.

Carbon sequestration

Because atmospheric carbon is a primary component in climate change and risk, much attention is being placed on forests as a way to reduce the negative consequences of climate change by sequestering (storing) carbon. In general, rural forests sequester from 11 to 21 tons of carbon an acre. Sequestration can range from 35 pounds per year for small, slow-growing trees to 800 pounds per year for larger trees growing at their most vigorous rate.

The Difficulties of Carbon Markets and Prices

Markets for carbon credits and carbon trading programs are being developed for national and international efforts to reduce greenhouse gas emissions. The development of carbon markets has been hampered in the United States by the fluctuation of the price per ton of carbon. For instance, a 1996 inventory of Philadelphia trees calculated a carbon storage of 530,000 tons with an estimated value of $9.8 million, which represents a trading value of $14.49/ton of carbon among 2,113,000 trees. But the 2008 inventory of street trees in Pittsburgh reflected a market trading value of $6.68/ton of carbon, considerably lower than the 1996 price in Philadelphia.

Recently in California, the State Air Resource Board was charged with administering Assembly Bill 32, California Global Warming Solutions Act of 2006. The mission of this act is no net loss of forest carbon. Several problems continue to slow their development of a carbon trading market, including the difficulty of monitoring forest carbon via remote sensing and estimating soil carbon. Conflict has been caused by the treatment of timber harvest as a carbon emission rather than considering the benefits of long-term storage in wood products. The long timeframes involved in carbon contracts (for example, 100 years), which some feel ignore the wholesale loss of standing forest carbon due to insects, disease, and fire, is also problematic. Some also question who actually profits from any carbon trading market—the landowner, or the broker trading the credits?

Society of American Foresters. 2011. Special issue: Managing forests because carbon matters: integrating energy, products, and land management policy. Journal of Forestry Supplement. 109(7S): 48 p.

Canada's 1.3 billion-acre boreal forest is estimated to store 67 billion tons of carbon with an estimated value of around $3.1 trillion. Maintaining existing forests, nationally and internationally, is considered one of the least expensive options for mitigating climate change. Although faced with some difficulties, efforts are underway in California and other States to reduce overall industrial carbon emissions by developing effective carbon markets and prices.

Threats to Ecosystem Services

Broadly speaking, natural processes that sustain human life provide ecosystem services. Prices and markets are used to quantify the value of these services. Some services, such as timber and tourism, are readily marketed and priced. It is harder to determine the monetary value of other services, such as cultural values or values to future generations.

> Natural processes that sustain human life provide ecosystem services.

Given the difficulties in valuation, the true short- and long-term costs and benefits of ecosystem services are not always adequately considered in net present value and other economic modeling. Ignorance and undervaluation of ecosystem services can cause natural resources to be overlooked or poorly considered in land development and other economic decisionmaking. Often the values of ecosystem services are only recognized when society has to pay to manage or repair them following such events as wildfire, flooding, stormwater damage, and erosion.

In addition to being inadequately valued in economic decisionmaking, ecosystem processes and services face other threats. Misunderstanding of ecosystem services by both citizens and elected officials impedes their consideration in land use planning and regulatory policy. Many times parks and other natural landscapes are viewed as only aesthetic resources, and the full value of economic, human health, and other services are not considered. The lack of planning at a multimunicipal or larger scale interferes with the conservation of healthy natural systems and high-quality human recreation.

Deforestation, degradation, and conversion of forests and other natural landscapes by suburban and rural development are other serious threats. By one estimate, 1.5 million acres of private forest land in the United States are lost to subdivision and other conversion each year.

Threats to Ecosystem Processes and Services

The many threats to forests and the ecosystem services they support are complex and interconnected. Here are some of the most pressing ones:

- Climate change, which is expected to produce warmer air temperatures, altered precipitation patterns, drought, and more extreme weather events.
- Air pollution, including regional deposition of heavy metals, ozone, nitrogen, sulfur, and hydrogen.
- Difficulties in placing values on ecosystem services and in developing economic markets for better understood services such as carbon sequestration.
- Increased public demand to live and recreate in forests, increasing their value and making them more attractive for conversion into residential development.
- Changing social and demographic values, such as an aging population of landowners, leading to an increase in forest sale and conversion.
- Lack of understanding among leaders and the general public about the value of nature to people and the places they live.
- Small planning scales and lack of multimunicipal or landowner cooperation.
- Inadequate consideration of natural resources in comprehensive plans, zoning, and capital budgeting.
- Invasive insects such as pine beetle and emerald ash borer, and invasive plants such as kudzu and European buckthorn.

Conversion of forests to other uses, especially to intense uses with impervious surfaces, can have detrimental effects on water supplies and carbon sequestration. Emissions from agricultural and other land conversion worldwide are estimated to account for one-fifth of current global carbon emissions. In addition, conversion and parcelization of forest often have a negative impact on wildlife, timber harvesting, and tourism. Conversion and parcelization can also increase the risk to life and property by wildfire and other natural forces.

Conversion of forest land to housing developments threatens the services that ecosystems provide. (Photo: ©Google)

Protecting Ecosystem Services

Having a diversity of markets for forest products and other ecosystem services may create an economic environment where owning and managing forest land for multiple benefits is more desirable than subdividing, selling, or converting the forested property. Developing carbon and other ecosystem service markets (for example, water quality trading) or paying landowners directly for conservation (for example, U.S. Conservation Reserve Program) can provide incentives for better natural resource protection and management by compensating landowners for their conservation efforts. There are a number of common payment approaches for conserving ecosystem services:

- **Voluntary transactions**, including the sale of carbon credits, conservation easements, and land for conservation to government and conservancies.
- **Public payments**, including payments from government agencies to landowners for afforestation, reforestation, or forest management projects.
- **Compliance-driven transactions**, including water quality trading, wetland or stream mitigation, and other mechanisms developed in response to government regulation.

Strategies to Protect Ecosystem Services

- Develop partnerships between landowners; businesses; and local, State, and Federal governments to understand and develop potential economic opportunities and markets for ecosystem services provided by private property.
- Educate leaders and citizens on the full scope of direct and indirect ecosystem services, such as human health and economic benefits, not just environmental and recreational ones.
- Always consider the natural environment in land use planning and regulatory policy.
- Work to establish multimunicipal, regional, and other larger planning areas.
- Increase early detection and management of ecosystem threats such as invasive species and excessive stormwater.

Other tools related to land use planning and regulatory policy include:

- **Tax policies**, such as appraising the worth of forest property based on how it is currently being used, not on its development potential or market value.
- **Nonregulatory strategies**, such as density bonus and other developer incentives.
- **Purely regulatory approaches**, such as zoning, subdivision, and land development ordinances.

Creating Ecosystem Markets

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- Willamette Partnership; Pinchot Institute for Conservation; World Resources Institute. [n.d.] In It Together: A How-To Reference for Building Point-Nonpoint Water Quality Trading Programs. Three parts. http://willamettepartnership.org/publications/ (23 October 2014).

Wetland on Mount Desert Island, Maine.

Paying Landowners for Stewardship of Ecosystem Services

Higher property values in many rural areas, coupled with aging landowners, are creating pressures to subdivide and develop private working forests. Creating markets for ecosystem services, providing financial incentives, and changing land-use and tax policy could help generate the revenue streams needed to raise the value of working forest lands so they can better compete with sales for residential development. Payments for carbon sequestration, watershed management, ecotourism, and a host of other services may supplement timber and other traditional forest revenues and promote long-term forest stewardship. There are a number of common payment approaches used in land-use policy design to conserve ecosystem services. These include:

1. Voluntary transactions such as the sale of conservation easements.
2. Public payments, including payments from government agencies to landowners for reforestation projects.
3. Compliance-driven transactions such as wetland or stream mitigation in response to government regulation.

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Western Forestry Leadership Coalition. 2010. Threats to western private forests: a framework for conserving and enhancing the benefits from private working forests in the Western U.S. Lakewood, CO. http://www.wflcweb.org. (19 April 2013).

The Economic Value of Open Space Protection

A 2010 study of the economic value of open space in southeastern Pennsylvania by the Delaware Valley Planning Commission and the Green Space Alliance identified substantial benefits, including:

- $61 million in annual water quality services (for example, filtering).
- $16.3 billion added to the value of housing stock, generating $240 million annually in property tax revenues.
- $17 million annually in air pollution removal and carbon sequestration.
- $1.3 billion in health-related savings resulting from physical activity.

Delaware Valley Regional Planning Commission. 2011. The economic value of protected open space in southeastern Pennsylvania. Pub. No. 11033A. Philadelphia, PA. 78 p.

Ecosystem Services and Green Infrastructure

Although forests and other large-scale landscapes are crucial in providing ecosystem services, the green infrastructure of parks, street trees, and other public landscapes in our cities and towns is also extremely important. Close to 80 percent of the United States population lives in urban areas, and the ecosystem services provided by the urban forest touch most citizens and visitors daily. There are an estimated 3.8 billion urban trees in the United States with an estimated structural value of $2.4 trillion. This estimate considers only the replacement of these trees and actually *under*estimates their value in terms of economic, environmental, human health, and other ecosystem services.

Urban trees and parks provide many ecosystem services.

Close to 80 percent of the United States population lives in urban areas. The ecosystem services provided by the urban forest touch most citizens and visitors daily.

The natural resources in our municipalities are highly diverse, ranging from healthy natural areas within urban wilderness preserves to open space and greenways, to traditional parks, to woodlots, and even to trees and plants found in streetscapes and other residential and business landscapes. Although it is obvious that larger scale systems such as regional parks and open space systems provide water, air, recreation, and other services, the many smaller structural components, including the canopy and roots of individual street trees, together contribute substantial energy and water and air quality services. The value of this bundle of services is a main reason why the conservation and management of trees and open space should be adequately considered in municipal land use planning and regulatory policy and budgets.

The many benefits provided by green infrastructure fall into several categories—environmental, health, economic, and societal.

Environmental Benefits

Among the many ecosystem services provided by urban trees and parks, those that have been particularly well studied and valued include energy and climate moderation, stormwater mitigation, and air quality.

Energy and Climate Moderation

Trees and parks moderate climate and help keep people and places comfortable, which in turn conserves energy and lowers energy costs. Trees and green areas cool the "heat island effect" that characterizes most urban areas. Temperatures under shade trees can be 9 degrees cooler than in sunny surroundings. Shading parking lots can reduce car interior heat gains dramatically—by as much as 47 degrees! If planted correctly on the east and west sides of a home, two large shade trees can save up to 30 percent on air-conditioning costs. Trees placed properly around buildings as windbreaks can save up to 25 percent on winter heating costs. According to some estimates, the proper establishment of 100 million mature trees around residences in the United States would save about $2 billion in reduced energy costs annually each year. By storing carbon, urban trees mitigate climate change and severe weather. Philadelphia's 2.1 million trees, for example, currently store approximately 530,000 metric tons of carbon at an estimated value of $9.8 million. Across the entire United States, urban trees currently store 770 million tons of carbon valued at $14.3 billion.

Stormwater Mitigation

Trees, other vegetation, and soils slow and filter stormwater. One hundred mature tree canopies intercept approximately 100,000 gallons of rainfall annually, significantly reducing stormwater management costs. In Philadelphia, for example, forested park land is estimated to save $5.9 million on water treatment costs each year. Conversely, the loss of 16 percent of Houston's tree canopy over the last three decades has resulted in a loss of $237 million in stormwater management services that trees provided.

Air Quality

Urban trees across the country remove about 780,000 tons of air pollution annually with a value of $3.8 billion. Some trees capture greater amounts of contaminants and carbon than others, which is one consideration when selecting tree species for planting in urban areas.

Trees help cool the "heat island effect" in urban areas. (Photo: Phillip Rodbell, U.S. Forest Service)

Did You Know?

A single, large shade tree can provide the following benefits each year:

- Saves $29 in summertime air conditioning by shading a building and cooling the air (250 kWh), about 9 percent of a typical home's annual air conditioning cost.
- Absorbs 10 pounds of air pollution, including 4 pounds of ozone and 3 pounds of particulates. The annual value of pollutant uptake by a single tree is $45 using local market prices of emission reduction costs.
- Intercepts and evaporates 760 gallons of rainfall in its own crown, thereby reducing stormwater runoff and flooding (valued at $6 a tree based on municipal expenditures for stormwater control).
- Reduces atmospheric carbon dioxide by the amount produced by a car driven about 400 miles.
- Cleans 90 pounds of carbon dioxide and 10 pounds of air pollution from the atmosphere through direct sequestration in wood as well as reduced power plant emissions.

Annual Energy, Carbon Sequestering, Air Quality, Stormwater, and Aesthetic Benefits of Trees in Lawrence Township, Pennsylvania

In 2011, i-Tree (http://www.itreetools.org/) inventory calculations estimated that 162 street and park trees located in Lawrence Township provided $49,400 in net ecosystem services. The trees:

- Saved 23.3 MWH of electric energy valued at $28,375 and 8,209 natural gas therms valued at $8,490.
- Sequestered a total of 120,545 pounds of carbon valued at $11,297 using a trading value of $12/ton in January 2011.
- Removed 147 pounds of ozone, 62.8 pounds of nitrous oxide, 30 pounds of sulfur dioxide, and 72 pounds of particulates worth $2,835.
- Intercepted 598,003 gallons of stormwater, providing $4,784 in stormwater management savings.
- Provided $10,773 in aesthetic benefits.

Active exercise and passive recreation help people ease their stress and be healthier.

Health Benefits

Trees and parks provide ecosystem services crucial for human health.

Psychological

Trees and other natural landscapes help satisfy a person's basic psychological and emotional needs. People find relief from crowding in green places that provide solitude, escape, and spiritual and aesthetic sanctuary. Encounters with nature—even simple views of nature—bring mental relaxation and aid in recovery from the cognitive and emotional fatigue that can result from the stresses of daily life.

Green places help satisfy a person's basic psychological and emotional needs.

Physical

The California Department of Health estimated that physical inactivity costs the State $13.3 billion a year in medical costs and lost productivity. According to those estimates, Californians could save more than $1.3 billion in health-related costs if they lost 5 percent of their weight, collectively, over 5 years. Trees and parks provide opportunities for active exercise and passive recreation, which in turn helps people ease their stress, reduce their weight, and be healthier through increased exercise. Studies have shown that people who view and interacted with nature have reduced stress responses, greater interest and attention capacity, better productivity, improved moods, and decreased feelings of anger and aggression. Hospital patients recovering from surgery who simply viewed trees through their windows required less pain relief, experienced fewer complications, and left sooner than similar patients with a view of a brick wall.

Children

Contact with nature helps relieve symptoms of Attention Deficit Hyperactivity Disorder in children; kids with this condition are better able to concentrate, complete tasks, and follow directions after playing in natural settings.

Contact with nature helps relieve symptoms of Attention Deficit Hyperactivity Disorder in kids.

Economic Benefits

While discussing an increase in tax and tourist dollars in the 1860s, famous city planner and landscape architect Frederick Law Olmsted wrote that enterprising cities would reap great economic benefits from great parks. Over the 150 years since then, the economic boost to residential and business property values provided by parks and other public landscapes has been well documented. These values can also have significant impacts on property and sales taxes.

Property Values

Public trees, parks, and open space can raise property values from 5 to 20 percent in municipalities that provide these public services. A Trust for Public Land 2007 study found that Philadelphia properties within 500 feet of parks were worth an average of 5 percent more, providing a total increase in value of $688.8 million and additional property taxes of more than $18.1 million. Recent studies by the University of Pennsylvania found that planting a tree within 50 feet of a house can increase its value by 9 percent, and that cleaning and greening vacant lots can increase adjacent property values by as much as 30 percent. Studies of large planned open space systems (for example, the city of Thousand Oaks in California and the Conejo Open Space Conservation Agency) indicate that those systems increase the value of all properties in the city, not just ones in direct proximity to open space.

Increased Business

The presence of public landscapes and parks also enhances public appreciation for the quality of commercial and other business areas. For instance, University of Washington researchers found that trees were good for business and shoppers stayed longer, visited more frequently, interacted with business owners more, and were even willing to pay higher prices for parking and goods in landscaped business areas.

Reduced Municipal Costs for Services

Research from Purdue University and Penn State suggests that industrial and commercial development tends to have positive tax and other fiscal impacts, while residential development tends to bring added municipal costs for services such as education, public safety, and transportation. In many situations, the cost of providing those services to new subdivision development exceeds the revenue from an expanded tax base. Studies by the American Farmland Trust have shown that the planned conservation of open space and parks, rather than intensive land development, can reduce municipal costs associated with subdivision.

Societal Benefits

The many ecosystem services provided by trees and parks also encompass a wide array of benefits to people and the communities in which we live.

Public parks provide places for families to recreate.

Public trees and parks provide an outdoor classroom for kids.

Family

Since youth are the foundation of any community, families and children need supportive and healthy environments to encourage positive behaviors and provide a respite from the challenges of life. Public landscapes and parks provide families places for talking, visiting, and recreating. Studies have shown that families living in Chicago public housing that had more trees and green space had healthier patterns of children's play, experienced fewer violent crimes and incivilities, were more constructive, used less violent methods to deal with family conflict, and exhibited less physical violence with partners. Contrary to the views of many law enforcement and public works officials, the planting and correct maintenance of trees and other vegetation increases people's sense of safety and welfare in inner-city neighborhoods and decreases feelings of fear and anxiety.

Educational

Public trees and parks foster an appreciation of nature among urban residents; provide outdoor classrooms (rooms with a view); and offer settings for interaction among teachers, children, and families. Natural landscapes in highly urbanized areas can create suitable and safe play spaces for children—places not overwhelmed by concrete and asphalt. Both the amount and creativity of play are greatly increased in schoolyards and other landscapes containing trees, plants, and grass. The trees in public landscapes may be the only "forests" that some people ever experience, which provides a context for the creation of values and ethics that urbanites place on the natural environment as a whole.

Scientific

Aldo Leopold said, "Open space provides the perfect norm for evaluation." Open space can be used to maintain and protect biodiversity and the natural influences and resources of flora and fauna and supply a "control" for the evaluation of research and urban existence.

Historical and Cultural

Open space and greenways can be used to preserve and protect archaeological and other cultural resources as well as remnant natural landscapes (for example, the Coastal Mediterranean Chaparral Ecosystem in California) in and near urban areas.

Ethical Responsibility

Preserving natural resources is an extension of human sensitivity to and concern for the natural world. It is an attempt to bring our species and nature into some sort of reasonable balance and improve our relationship with the natural world.

Preserving natural resources is an extension of human sensitivity to the natural world.

Sense of Place

The natural environment of a municipality plays a significant role in the healthy and successful social lives of people by providing many things, including shared and structured symbols. These symbols (historical landscapes, important views, trees, hills, streams) help ground people in their everyday lives and, as change occurs, provide a consistent and familiar sense of place and comfort. With proper planning and management, municipal trees and parks serve as shared and structured symbols that help form the features and shape the identity of a place, invoking pride, attracting outside attention, and stimulating economic activity.

Community Development

Trees and other natural features serve as fundamental elements in developing the process of community in four ways:

1) Landscapes such as parks, open spaces, and tree-lined streets provide places for humans to interact.

2) The natural environment in planned open space, parks, and greenways reinforces the unique physical realities of a locality. Nature can be used to provide distinction to communities and neighborhoods amidst a sprawling wave of suburban development.

3) Because decisions about land use and development can be at the heart of community conflict, encouraging and empowering people to become jointly involved in decisionmaking (through public hearings, development review, ad hoc and standing committees, even public protest) supports the interactional component of community.

4) Nature can be used to support volunteer and educational opportunities, which builds both social interaction and individual human capacity.

Nature can bring people together as volunteers in a project.

Case Study — Ecosystem Values in Oregon's McKenzie Watershed

A panorama of the McKenzie River from Armitage County Park near Coburg, Oregon. (Photo: http://en.wikipedia.org)

A study by the Eugene, OR, Water and Electric Board and Earth Economics provides an economic characterization of ecosystem goods and services found in the McKenzie watershed. The watershed spans forests, rivers, lakes, wetlands, grasslands, shrub, snowpack, and agricultural lands. Ecosystem goods and services include drinking water for 200,000 people, fish, timber and agricultural products, flood protection, hydroelectric power, recreation, and local weather and climate stability. Using benefit transfer methodology (BTM) and geographic information systems data, these services were identified and valued. BTM (http://www.ecosystemvaluation.org/benefit_transfer.htm) is used to estimate values for ecosystem services by adapting an estimate completed for another location.

For the assessment, the watershed was divided into 10 land cover types using geographical information systems data: agricultural lands, pasture, forest (five age groups), riparian buffer, urban green space, grassland, shrub/scrub, lakes/rivers, wetlands, and other. Each natural land cover across the watershed produces a unique suite of up to 23 ecosystem services. Ecosystem services were identified for nine of the land cover types, and a subset of these services was assigned dollar values using BTM. The ecosystem services examined included climate stability, flood protection, water filtration and supply, wildlife habitat, soil erosion control, and recreational value.

This initial estimate showed that the value of economic benefits provided by the McKenzie Watershed is enormous. In a conservative analysis, results demonstrated that watershed ecosystems provide between $248 million and $2.4 billion in benefits to the regional economy each year. The range is wide, but will narrow with more detailed analysis of key ecosystem services and land cover types, and as spatial mapping of the watershed's ecosystem services is completed. The low end of the range can be considered a baseline value and an underestimate. The following steps are recommended based on the study findings:

- **Invest in natural capital.** The conservation and restoration of ecosystems is a key asset and investment opportunity for promoting economic prosperity.
- **Conduct detailed valuation, mapping, and modeling of key ecosystem services.** Detailed valuation studies help support cost-effective investments. Sophisticated maps show geospatially where specific ecosystem services, such as drinking water quality or flood risk reduction, are and who benefits from those services.
- **Review institutional options for managing natural assets.** It is important to fund institutional improvements that support ecosystem services, including drinking water quality, salmon habitat restoration, recreation, stormwater conveyance, and forest stewardship.
- **Use ecosystem services to advance rural economic development.** By including agriculture, sustainable forestry, and access to quality outdoor recreation in economic development planning, long-term and sustainable jobs continue to be identified, quantified, and secured.
- **Include ecosystem service valuation in accounting and decisionmaking tools.** The value of ecosystems should be correctly measured and considered in decisionmaking. The creation of macroeconomic measures, such as measures for the Gross Domestic Product, transformed the United States because these measures enabled better economic decisionmaking. Correct ecosystem service valuation provides governments, organizations, and private landowners a way to calculate the rate of return on conservation and restoration investment.

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Relevant Factsheets

A1 – *Using Smarth Growth Principles to Plan Sustainable Communities* – Principles of smart growth are used to increase and protect ecosystem processes and services.

N1 – *Developing a Natural Resource Assessment* – Assessments allow municipalities to locate and describe important resources and determine the best tools (e.g., open space referendum) for conserving ecosystem services.

N2 – *Comprehensive Planning for Natural Resource Conservation* – Comprehensive plans should identify and discuss the benefits nature provides to a place and to the people who live there, as well as strategies and tools for conservation.

N3 – *Regulatory Approaches to Protecting Natural Resources* – Zoning and other ordinances enhance ecosystem services by protecting riparian areas and other important landscapes.

N4 – *Nonregulatory Approaches to Natural Resource Conservation* – Open space acquisition, public education, and other nonregulatory approaches enhance ecosystem process and services.

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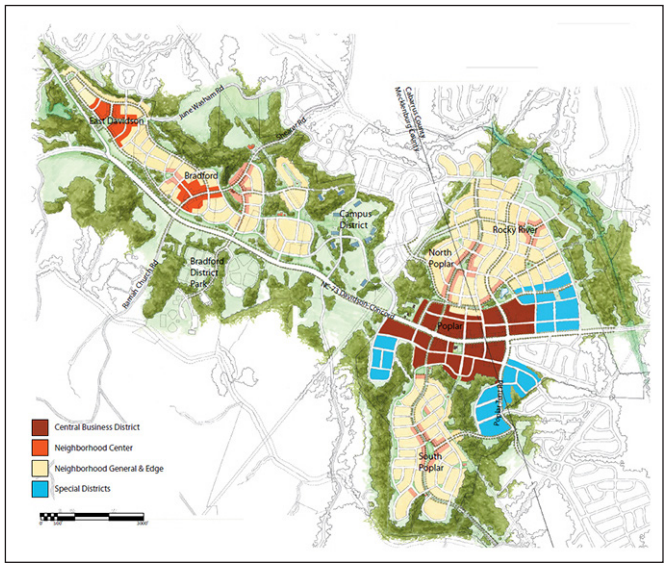
Changing Landscapes

Land use planning curriculum for natural resource professionals

P rinciples, people, and policies
L and planning and pressures
A pproaches
N atural resource planning tools

L1: Principles of Planning



NC 73: Town of Davidson [NC] Concord Road to Poplar Tent Road Small Land Use and Economic Development Plan map. (Map: http://ci.davidson.nc.us)

Overview

This factsheet provides an overview of the fundamental basis for why we plan. It discusses the basic elements of planning and offers an understanding of how public support strengthens the planning process.

What is Planning?

Planning is a comprehensive and collaborative practice where residents, business owners, landowners, decisionmakers, and interest groups work together to define a community's vision for the future. Planning helps us recognize, preserve, and enhance the qualities that make our communities the places where we want to live. Planning allows communities to shape their future based on available resources, needs, and desires. Planning is an ongoing process of involving and preparing a community for the future, measuring its strengths and weaknesses, examining future trends, and proposing solutions that help all members of the community. It helps find the right balance of new development and public services, environmental protection, and sustainable growth.

Land use change is perhaps the single most important factor influencing our environment. It is exacerbated where there is an absence of any land use planning. These changes are largely the result of urbanization and its associated residential, commercial, transportation, and, to a lesser extent, industrial development. While some level of new development is needed to keep up with our expanding population, the ramifications of unplanned growth and sprawl on agriculture, natural resources, and the environment as a whole are many and cumulative. Impacts result in loss of revenue, quality of life, essential habitats, species, and ecosystem services.

The ramifications of unplanned growth and sprawl on agriculture, natural resources, and the environment as a whole are many and cumulative.

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Planning is important because it establishes a community's priorities; helps guide development; and educates residents, landowners, developers, business owners, and even public officials about the process required to design, review, permit, and implement a project. Planning brings people together to discuss and make decisions about a community's future while creating a forum where all community members can be actively involved in the decisionmaking process.

Key Advantages of Planning

- Establishes a community's long-term goals
- Sets forth strategies and actions to accomplish goals
- Facilitates local decisionmaking
- Provides guidance to developers, local governments, and property owners
- Creates a science-based inventory of a community's resources
- Preserves, maintains, and manages important resources
- Informs the public about options and conditions as a basis for making decisions
- Retains community character

Why Plan?

There are many reasons to plan. Planning prepares for the future. If decisions about how a community intends to grow are made before unwanted development occurs, resources important to community sustainability can be protected and preserved. Planning helps guide cost-effective decisionmaking because it addresses issues before they become problems that can cost communities hundreds of thousands of dollars to correct. Directing growth into developed areas can save communities money because infrastructure and services are more efficiently provided and less costly.

Planning helps balance a community's needs and desires and provides a rationale for assigning priorities. It guides decisions using validated data that provides a basis for making informed decisions. The planning process can be used to coordinate all aspects of development. It can ensure that there are adequate community services, needed facilities, road systems, and utility infrastructure to accommodate growth; at the same time, planning can be used to protect critical natural and cultural resources.

Elements of Planning

Most planning is conducted within a legal framework. Each community's power to plan comes from state-enabling legislation, which either allows, or requires, local governments to adopt comprehensive plans as the fundamental tool of planning. Comprehensive plans cover many areas of planning from transportation to housing to economic development. However, each form of planning usually goes through the same process of data gathering, analysis, policy making, implementation, monitoring, and enforcement. The comprehensive plan provides the framework for this process, and every community's plan must comply with some basic planning elements that are briefly discussed below.

Developing a vision and goals starts with a community working together to identify issues and opportunities, challenges, and hopes.

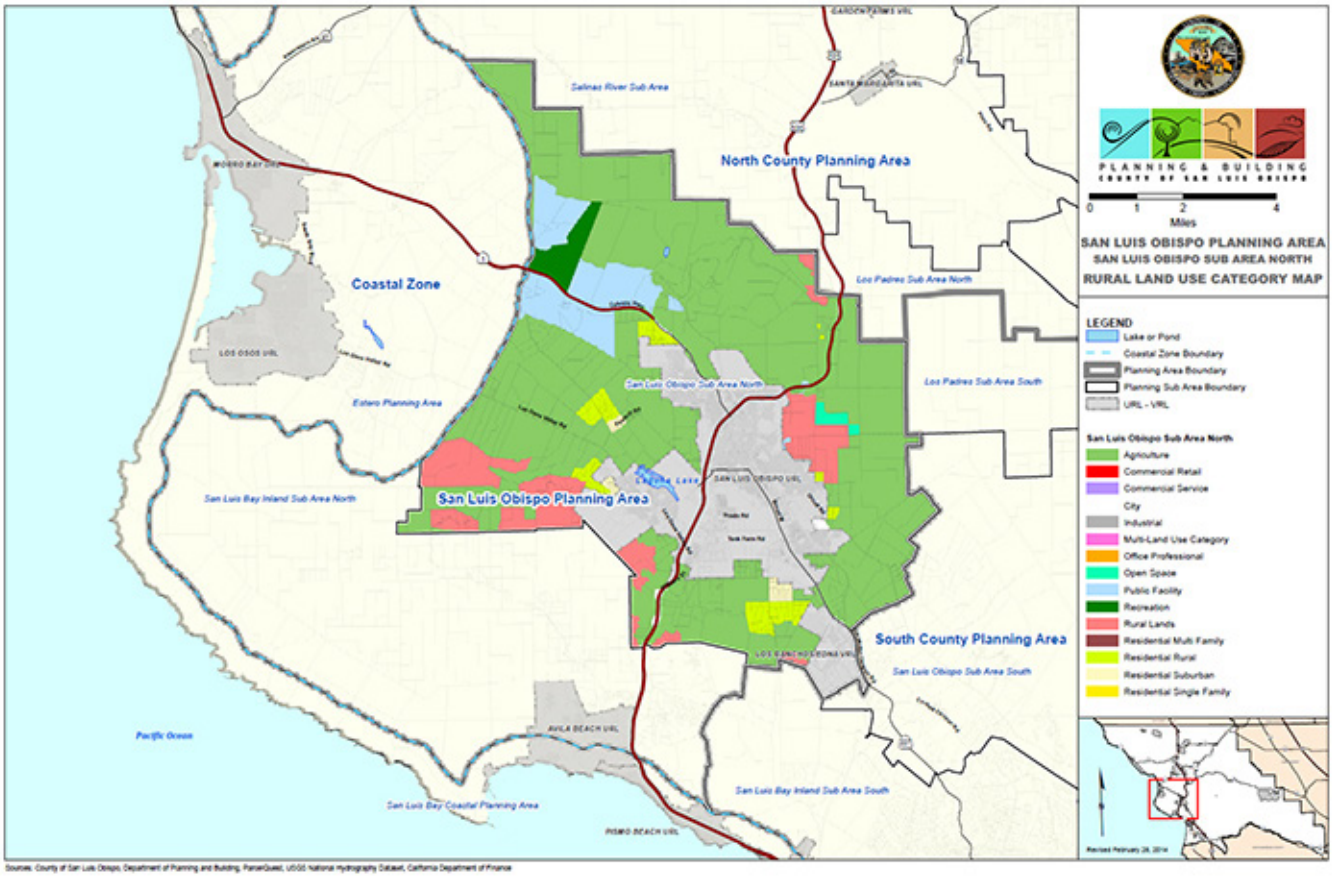
Developing Vision and Goals

Visioning begins with a community working together to identify issues and opportunities, challenges, and hopes. Visioning seeks to find common ground among disparate groups of people. The end result is a long-term statement that captures the essence of the community and what it seeks to be. Visioning leads to the development of goal statements that provide direction on how their vision can be achieved. Community objectives often identify how transportation issues, development, or even the care of parks and open spaces are addressed.

The development of a vision and goals helps communities avoid piecemeal and reactionary approaches to addressing growth and development. It recognizes that there is a relationship between issues and takes into account trends that may affect future conditions, such as population growth or unemployment. Setting a vision and goals helps communities address challenges and balance competing interests while providing a blueprint for future development that reflects the greater vision and keeps coherence in the pattern of development.

Land Use

Land use refers to human use of the land, including management and modification. Most States require an assessment and categorization of land, which includes the general distribution, location, and characteristics of current and future land uses. Land use is typically documented using maps that identify existing uses. Land use planning considers existing land use patterns and seeks to identify the most suitable areas for growth and development, conservation, transportation corridors, community infrastructure, recreation, and open space. Once these areas are identified and their boundaries are established, land use planning is used to support goals and policies that appropriately direct and manage growth within existing or proposed land uses.



Land use is typically documented using maps that identify existing uses. (Map: http://www.slocounty.ca.gov)

Transportation planning addresses present and future needs of all modes of transportation, including rail.

Transportation Planning

Transportation planning addresses the present and future needs of all modes of transportation. This includes roads, traffic circulation, transit, airports, rail , sidewalks, and bicycle and multiuse paths. Transportation elements depend on location and context. Is it a rural area or a major urban city? Transportation planning maps illustrate the existing and planned road network. They also indicate the carrying capacity of roads; current traffic loads; alternative transportation routes, such as sidewalks; transit stops and future transit routes; and so on.

There is a strong connection between land use and transportation. Major transportation improvements encourage new development opportunities either through new access or ease of access. Likewise, a number of factors—density, concentration and mix of uses, accessibility, employment opportunities, housing availability, layout, design, and timing of land development—play a significant role in the demand on transportation systems. Understanding how transportation influences land use patterns and vice versa is an important element in planning. When done properly, transportation planning can predict transportation demands and be used to control development patterns. This in turn can prevent sprawl and unwanted development in natural areas, areas of cultural significance, or even sacred community places.

Infrastructure

Infrastructure planning can help a community address the availability of necessities such as electricity, telephone, natural gas, sewer, and water. Infrastructure planning begins with an inventory of existing facilities. Infrastructure significantly influences the patterns of growth. If services are not available, development is not likely to occur. If the extension of services is provided without considering natural resources, secondary impacts, and even aesthetics, unwanted and unmanaged development can occur and impact sense of place, the economic vitality of a community, and even human health.

Planning for community facilities and services includes fire protection for the general welfare of residents.

Planning for Community Facilities

Planning for community facilities provides for the construction or acquisition of governmental or quasi-governmental services on the public's behalf. This includes services and facilities necessary for public health, safety, and general welfare such as police, fire, and schools. They can also include services that contribute to the cultural opportunities within a community such as libraries, theaters, and museums. Parks and open space are usually included in community facilities and are sometimes addressed in a separate plan, such as an open space plan. Governmental and community services can be the largest employer in a town.

Community facilities can be focal points in a community. They may help define community character and often determine a community's desirability as a place to live and work. Community facilities and services can direct where, when, and at what scale development will occur. Community facilities are usually located

in proximity to the people and neighborhoods they serve, and development is more likely to occur where facilities are already present. However, community facilities can also be directly influenced by growth. Growth adds people, streets, and buildings to a town, which results in increased traffic, expanding service areas, more maintenance, and higher capital expenditures. It is imperative that a community plans for the growing needs of its population so that public facilities and services can accommodate changing cultural and land use patterns.

Housing

An adequate and affordable supply of housing is essential to the health, economic vitality, and quality of life of a community. When housing is not appropriately planned for in a city or town (i.e. in walkable neighborhoods with access to public transportation, parks, and civic spaces), people seek homes in outlying areas where housing demand is less and prices are lower. This contributes to sprawl development, which can result in air and water pollution; higher energy costs; increased demand on public facilities and services; development pressures in natural, undeveloped areas; segregation and lack of diversity; and overall loss of neighborhoods and community character. Planning for housing can sustain or accelerate a community's economy, protect the environment, reduce infrastructure and facility costs, encourage social integration, and maintain a sense of place.

An adequate and affordable supply of housing is essential to the health, economic vitality, and quality of life in a community.

Economic Development

Planning for economic development helps stimulate community growth; preserves existing jobs; and is often linked with other community priorities related to housing, transportation, and the environment. An economic plan usually begins with collecting background information relevant to the financial health of a community such as the existing labor force; projected employment growth; existing businesses; and vacant or unused commercial, industrial, and institutional lands. This information is used to identify the strengths and weaknesses of the local economy and help the community define what it can do to maintain, diversify, or improve its economic development.

Economic plans are closely tied to housing and development, and should include strategies for smart growth. Walkable and robust downtowns attract businesses and visitors, increase access to downtown districts through better transportation options, and use existing infrastructure. A community that prepares to meet future economic challenges can help preserve important assets, support existing infrastructure, and improve the quality of life for all residents. Many regions prepare a comprehensive economic development strategy that analyzes the regional economy and serves as a guide for establishing regional economic goals and identifying investment priorities.

A community that prepares to meet future economic challenges can help preserve important assets and improve the quality of life for all residents.

Natural Resource Protection

Identifying critical natural resources at the outset of planning provides opportunities for communities to use integrated approaches to protect them early in the planning process. It enables growth and development to be directed away from critical natural areas and makes compliance with local, State, and Federal policy much easier in the long run.

Planning efforts should begin with an inventory and assessment of natural resources such as soils; water bodies; wetlands; steep slopes; rare, threatened, and endangered species; and wildlife habitat. The inventory process ensures that the value of and threats to critical and sensitive natural resource areas are evaluated.

One of the first things to do when planning is to take an inventory of natural resources, such as water bodies. (Photo: http://usda.gov)

Incentives for Planning

Effective planning ensures that growth and development occur when and where they are most beneficial to a community. Communities that protect their natural and cultural resources are much better places in which to live, work, and raise families. Data related to real estate prices support this by showing that livability and access to community amenities and services directly impact how much people are willing to pay for homes.

When public involvement is integrated into the planning process, local residents and groups can provide additional information and resources that may not otherwise be known or available to planners.

Planning is a means of educating, involving, and informing the public and decisionmakers. It can uncover potential for positive change in a community in ways that were never before thought possible. Working closely with the public results in greater insight into communities and more often produces results that are more easily embraced by community residents. The process of working together builds confidence and trust. People who are involved in community decisionmaking processes are more likely to support decisions that positively affect a community's future.

Planning with natural resources in mind can save development costs because environmental constraints are considered before issues arise. It can make communities more attractive and marketable. Cultural resources such as historic buildings and sacred places are irreplaceable once lost. The preservation of working economies like agriculture and forestry can strengthen a community's economic health and ensure that a sense of place is not lost during the development process.

Importance of Public Involvement

The most effective planning processes are developed through collaboration and inclusive community participation. It is important for towns to recognize and encourage, and perhaps even require, community involvement throughout the planning process. Involvement should include a number of consensus-building and conflict management approaches that include public meetings, workshops, charrettes, fairs, surveys, focus groups, and citizen advisory committees. Public hearings are the most commonly used way to involve the community. They may become adversarial, especially if the conversation becomes polarized in one direction rather than being an open group discussion.

Public hearings are the most commonly used way to involve the community. (Photo: http://www.hanover-ma.gov)

Communities must get past conflict and work through it so that it does not lead to reduced involvement during planning. There will be differences in opinion when information is being gathered for planning. These differences must be respectively heard, documented, and addressed; otherwise, they will continue to surface throughout the process. This ensures that the opinions, issues, and needs of all residents are adequately addressed—from residents of different geographic areas of a town to those of differing backgrounds, citizens' groups, and special interest groups.

Most importantly, it is essential that people understand how important their role is in shaping the future of their community. Their input helps define values, goals, needs, and desires of the entire community. Furthermore, by involving the public in all stages of the planning process and offering an open exchange of ideas and information, a town's comprehensive planning process, master planning efforts, and all other applicable planning initiatives will be more relevant. An involved public will have a greater feeling of involvement and control in the community's future. This involvement will result in broader support and help ease the adoption and implementation of plans and regulations.

It is essential that people understand how important their role is in shaping the future of their community.

"A positive, open, and collaborative civic culture will not only bring political, technical, and values-oriented criteria together, but it will help promote constructive community decisionmaking and trust between citizens and local officials. In addition, better decisions will emerge as communities enable joint thinking among a diverse group of people, thus encouraging greater creativity and a larger number of options of better quality."

—American Planning Association's Growing Smart Legislative Guidebook: Model Statutes for Planning and the Management of Change

"Even when you are not required to invite the public into the deliberations, it may be a very good idea if you do. Enlisting the public as a partner, or at the very least, informing it of your point of view, can defuse potential opposition, acquire allies in unlikely places, and unite a community and its leaders around a common purpose. It also builds trust."

—Successful Public Meetings: A Practical Guide

Case Study — Vision 2020: New York City Comprehensive Waterfront Plan – New York, New York

Vision 2020 is an example of how the city's vision for a sustainable, vibrant waterfront was realized through long-range planning. With the newfound availability of 520 miles of shoreline that had been inaccessible to the public for decades, the New York City Planning Department embarked on a yearlong participatory process to develop *Vision 2020: New York City Comprehensive Waterfront Plan*. The plan provides a sustainable framework and is developed around eight specific planning goals. These goals focused on expanding use of the waterfront for parks, incorporating mixed-use development, providing waterway transportation, and improving and protecting natural habitats. The plan outlines many new citywide policies and site-specific recommendations, including a set of 130 short-term implementation projects that have an expected cost of $3.3 billion. These proposed projects are expected to catalyze waterfront investment, improve water quality, and expand public access. The *Vision 2020: New York City Comprehensive Waterfront Plan* is available for download at http://www.nyc.gov/html/dcp/html/cwp/cwp_2.shtml.

For more information, visit the Department of City Planning, City of New York Web site at http://www.nyc.gov/html/dcp/html/about/pr031411.shtml.

Vision 2020: New York City Comprehensive Waterfront Plan.

Relevant Factsheets

P1 – *An American History of Planning* – Provides an overview of the formative years of planning and discusses these influences on the practice of modern planning.

L2 – *Scales of Planning: From Landscapes to Ecosystems* – Helps us understand the levels and complexities of planning.

N2 – *Comprehensive Planning for Natural Resource Conservation* – Provides an overview of comprehensive planning and the tools required to best protect natural resources.

N5 – *Planning for Healthy Forests and Timber Operations* – Provides useful forestry operations resources, tools, and Best Management Practices that can be used in developing comprehensive plans, zoning, and other land use regulations.

Resources

Daniels, Tom. 2014. The environmental planning handbook for sustainable communities and regions. 2d ed. Chicago: American Planning Association Planners Press. 792 p.

Kelly, Eric Damian. 2009. Community planning: an introduction to the comprehensive plan. 2d ed. Washington, DC: Island Press. 424 p.

Meck, Stuart, gen. ed. 2002. Growing smart legislative guidebook: model statutes for planning and the management of change. Chicago: American Planning Association Planners Press. 1,400 p.

The Cities Alliance; United Nations Environment Programme; International Council for Local Environmental Initiatives – Local Governments for Sustainability. 2007. Liveable cities: the benefits of urban environmental planning. A Cities Alliance study on good practices and useful tools. Washington, DC: The Cities Alliance. 139 p.

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Changing Landscapes

Land use planning curriculum for natural resource professionals

P rinciples, people, and policies
L and planning and pressures
A pproaches
N atural resource planning tools

L2: Scales of Planning: From Landscapes to Ecosystems

Planning occurs at many different scales.

Overview

Planning occurs at many different levels, or scales, and with very diverse objectives in mind. This factsheet will provide resource professionals with an overview of these different levels from small-scale landscapes to large-scale ecosystems. It discusses past and current drivers of planning efforts as well as what is expected to drive future planning.

Defining Planning at Different Scales

Planning happens at different levels with different goals and objectives. Planning boundaries or areas can be defined politically, geographically, or ecologically. Traditionally, planning areas were mostly delineated by political or jurisdictional boundaries defined by governmental agencies. The primary considerations were major natural features, such as rivers, along with politically derived survey lines. Today, boundaries that are delineated by natural features, such as watersheds and ecosystems, play an increasingly important role in planning efforts.

Politically Defined Planning Areas were historically negotiated "lines on a map" that included only major natural features, such as rivers and mountains. The size of the planning area was generally determined by the extent of the human community and delineated by city limits or county lines.

Geographically Defined Planning Areas are created by using physical boundaries within the landscape, most commonly watersheds. Watershed boundaries provide an identifiable limit to the plan area while encompassing most of the features that influence natural and manmade systems. Geographically defined areas may be wholly located within one jurisdiction or overlap many jurisdictions.

Ecologically Defined Planning Areas are created by drawing from natural systems using maps of habitats and ecosystems as a guide. This type of planning approach considers the necessity of encompassing larger plan areas in an effort to maintain functional ecosystems.

Ecologically defined planning considers larger areas with the goal of maintaining functional ecosystems.

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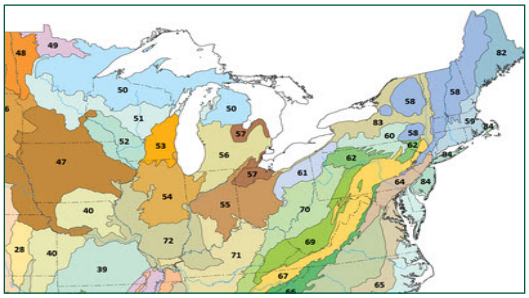
Where Have We Been As Planners?

The history of planning is long and eventful in the United States. Most resource professionals are familiar with planning at ecological scales, which is not very different from planning at jurisdictional scales. The following overview of planning scales will help natural resource professionals relate the scales of planning to natural resource planning scales with which they may be more familiar.

State-level Planning – In ecological terms, state-level planning would be equivalent to planning at the ecoregion scale. Typical state-level planning activities include planning for preventing and mitigating emergencies such as drought, earthquakes, wildfires, flooding, and hazardous material incidents. Statewide Forest Action Plans are an example of planning that takes place at the State level. Forest Action Plans evaluate conditions, trends, and threats facing each State's forest resources and provide a roadmap for forest resource sustainability. State-level planning boundaries are politically defined.

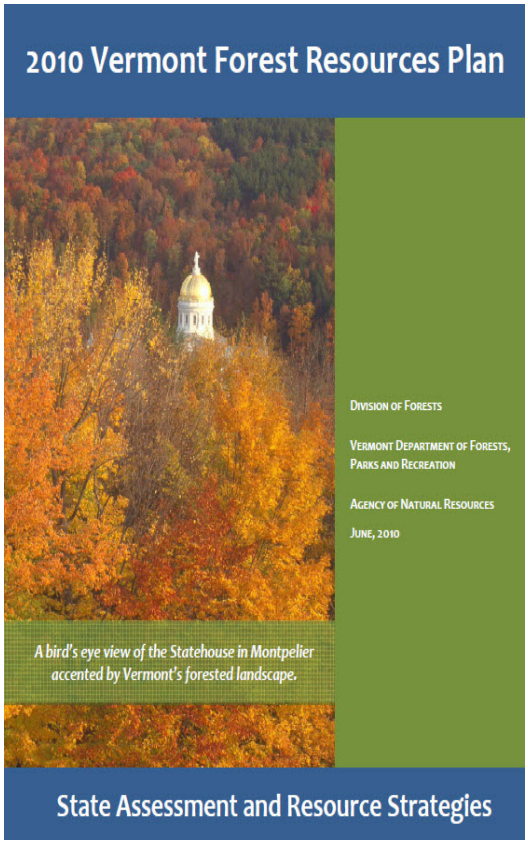


The Ecosystem Land Classification System defines ecoregions as areas whose ecological systems and their components are relatively homogeneous. (Map: http://www.epa.gov)

Regional Planning – Regional planning is equivalent to planning at the landscape scale and typically occurs in metropolitan areas that include parts of multiple communities, counties, or States. Many metropolitan areas have their own metropolitan planning organizations (MPOs) that prepare long-range plans and policies to guide growth and development within the region. MPOs frequently work in five target areas: community design, open space, transportation, workforce and the economy, and housing. Regional planning boundaries are typically geographically defined.

Comprehensive Planning – Comprehensive planning is equivalent to planning at the ecosystem scale, which generally occurs at the county or community scale. The goal is to create an official plan that establishes guidelines for the future growth of a community. Comprehensive plans are adopted and used to guide decisions about development in the community. Most commonly, comprehensive plans address compatibility between various land uses, management and preservation of natural resources, identification and preservation of historically significant lands and structures, infrastructure needs, schools, recreation, and housing. Comprehensive planning boundaries are politically defined.

Area Planning – Area planning is equivalent to planning at the habitat scale, is generally created for districts within a large community, and is subject to the guidelines of comprehensive plans. A large- or medium-sized city often has multiple district plans or area plans that address smaller-scale goals of each part of the city. Local plans focus on issues that are unique to the locality and may include detailed items such as density requirements, building setbacks, or even requirements for the design of commercial signs. Local planning boundaries are often determined by major streets or landscape features and may be politically or geographically defined.

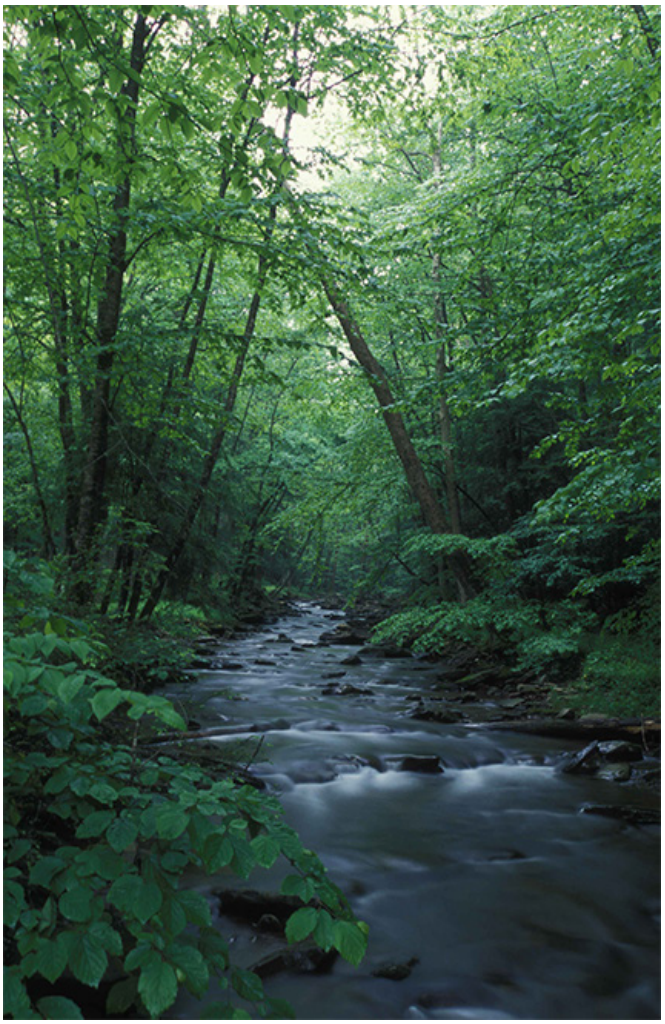

2010 Vermont Forest Resources Plan
A bird's eye view of the Statehouse in Montpelier accented by Vermont's forested landscape.
Division of Forests
Vermont Department of Forests, Parks and Recreation
Agency of Natural Resources
June, 2010
State Assessment and Resource Strategies

Statewide forest action plans are an example of planning at the State level.

Planning's Future – Where Do We Go from Here?

While traditional planning efforts have been useful and successful in their time, there is always room for improvement. Past plans reflected a more egocentric approach to planning that focused on the role of humans within the landscape with little to no consideration for natural systems. However, in today's climate of environmental awareness, the need to integrate natural systems into the planning process is greater than ever. Two planning processes that integrate natural resources are watershed and ecosystem planning.

Watershed Planning – This is the most commonly recognizable planning effort that communities are using throughout the country. As society's progress results in increasingly detrimental impacts on natural resources, communities are embracing watershed planning as one way to protect and manage these valuable resources across jurisdictional boundaries.



Watershed planning is the most commonly recognizable planning effort communities use in the United States.

Successful watershed planning takes place with a variety of community and agency partners. Programs such as the National Estuary Program are examples of partnerships where Federal, State, and local agencies and organizations work together to address the challenges of watershed management.

The Environmental Protection Agency has a wealth of resources available to help communities and organizations develop and carry out watershed plans to meet water quality standards and protect water resources. For more information, go to http://www.epa.gov.

Ecosystem Planning – Bailey (2009) defines this type of planning as the process of prescribing compatible land uses based on ecosystem capability, which is the ability to sustain resource productivity and maintain ecosystem processes and function. Ecosystem planning and management stress the interrelationship of ecosystem components and provide the basis for making predictions about resource interactions.

Like traditional planning, ecosystems must be recognized and planned for at various scales. Successful planning requires delineating ecosystems at a level and scale appropriate to management levels. The Ecosystem Land Classification System was developed to divide the landscape into ecosystem units of various sizes. As with watershed planning, ecosystem planning requires partnerships and a collaborative process that uses science to help make decisions.

> "Land management is presently undergoing enormous change—away from managing single resources to managing ecosystems."
>
> —Jack Ward Thomas
> Former Chief, USDA Forest Service

Case Study — Chesapeake Bay Program

This program is a regional partnership that engages many diverse agencies, organizations, and academic institutions in efforts to restore and protect the Chesapeake Bay. The program was established in 1983 and built upon the idea of collaboration. Partners bring their leadership and expertise to work toward achieving a shared vision of a restored Bay. Programs and projects include modeling; monitoring; quality assurance; resource lands assessment; developing Total Maximum Daily Load data for the entire watershed; and developing strategies that address water quality issues related to urban stormwater runoff, brownfields, and agriculture.

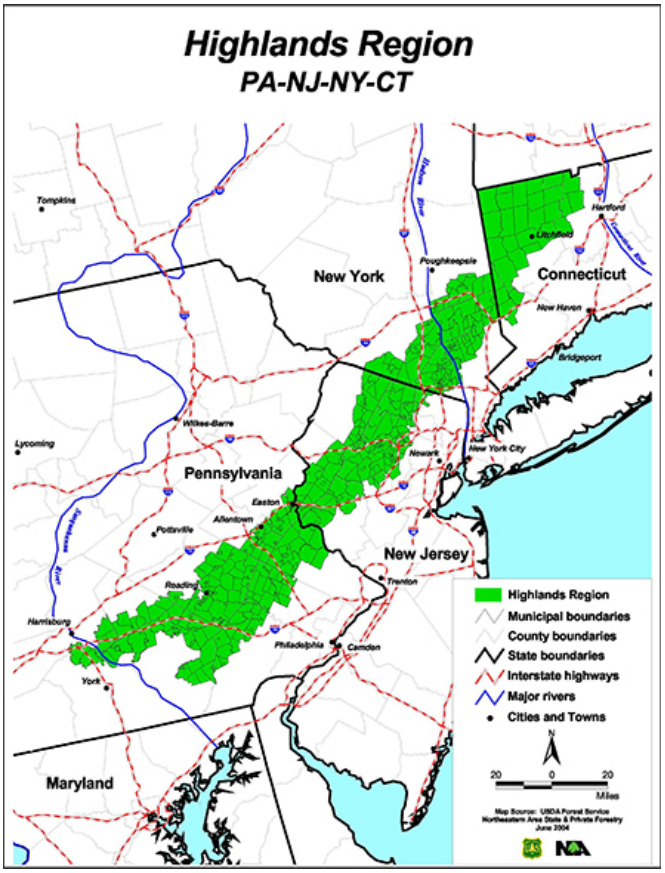
For more information, go to http://www.chesapeakebay.net.

Chesapeake Bay Program
Science. Restoration. Partnership.

Case Study — Highlands Regional Study

The Highlands encompass 3.4 million acres within a four-state region (Connecticut, Pennsylvania, New Jersey, and New York) in the northeastern part of the country that is protected under the 2004 Highlands Conservation Act. The goal of the act is to protect the wealth of nationally significant natural resources and their associated benefits from the impacts of development. The original study boundaries were delineated by municipal boundaries. This resulted in an area that, while defined by political boundaries, was large enough to contain most of the geological and ecological resources that define it.

For more information, go to http://www.na.fs.fed.us/highlands.



Map of the Highlands Region.

Relevant Factsheets

P1 – *An American History of Planning* – Provides insight into the history of planning to better understand what is current and how this relates to the future of planning.

P5 – *Principles of Ecosystem Services* – Helps resource professionals understand the need for a broader, systematic approach to planning.

L3 – *How Planning is Put into Practice* – Provides an overview of the mechanisms that are used to put planning into practice at the local, State, and Federal level.

N2 – *Comprehensive Planning for Natural Resource Conservation* – Provides a thorough description of the most commonly used planning tool, the comprehensive plan.

N5 – *Planning for Healthy Forests and Timber Operations* – Provides an overview of tools used to carry out sound planning and stewardship.

N6 – *Planning Tools to Protect Water Quality*– Provides an overview of the tools used to protect water resources.

Resources

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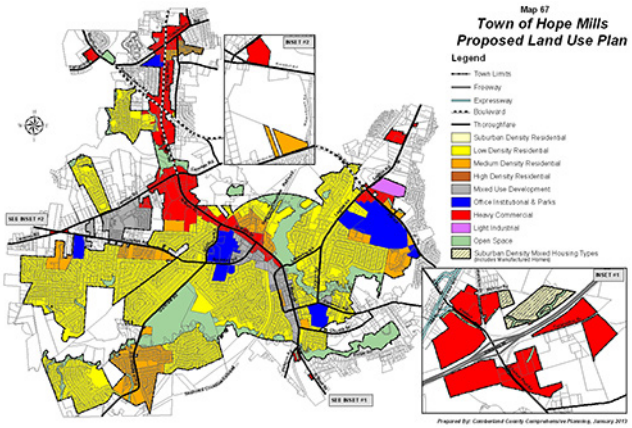
Changing Landscapes

Land use planning curriculum for natural resource professionals

P rinciples, people, and policies
L and planning and pressures
A pproaches
N atural resource planning tools

L3: How Planning is Put into Practice



Comprehensive land use plans are one way that planning is put into practice. (Map: http://www.co.cumberland.nc.us)

Overview

There are established mechanisms that put planning into practice at the State, regional, and local level. Examples include enabling legislation, comprehensive plans, zoning, and subdivision land development ordinances. The nomenclature and regulatory authority associated with these mechanisms may vary, but they all provide a common ground for planning. This factsheet describes how planning responsibilities are organized and how these mechanisms are carried out at State, multijurisdictional, and local levels.

Enabling Legislation

State-enabling legislation is used to grant local planning authority. State-enabling legislation is the legal framework that directs how and where land use occurs in each State. It identifies the authority, organizational structure, and set of procedures to carry out and enforce the law.
This includes the adoption of comprehensive plans, development of zoning ordinances, approval of site plans, issuance of special permits, and other actions related to development. Enabling legislation may also provide authority for States and local governments to regulate development as it pertains to wetlands, roads (county and State), protection of natural resources, and development of public water and wastewater systems.

Each State has enabling legislation that is unique. For example, some States give municipalities little or no authority to plan. Planning issues and activities are addressed through State agencies only. In other States, planning is highly structured, and local governments are required to take certain actions consistent with state-enabling legislation (e.g. planning for natural resources).

The basic foundation for planning and zoning in the United States was established in the 1920s by two enabling acts, commonly known as the Standard Acts. The first, "A Standard State Zoning Enabling Act," was initially printed in 1924 and included provisions specific to zoning regulations. The second, "A Standard City Planning Enabling Act," was first printed in 1927 and dealt with comprehensive plans and subdivision regulations. These Acts were prepared to establish a nationwide framework that was consistent and constitutional.

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Sometimes the boundary is not clearly defined, or there may be a question about whether a particular action is enabled by statute. In such instances, either the Home Rule or Dillon Rule is used to determine the bounds of legal municipal authority. Because each State governs and carries out regulatory policy and land use controls differently, regulatory procedures and authorities can influence how planning works differently among States.

The **Home Rule** states that municipalities are free to pass laws and ordinances as they see fit, as long as they obey State statute or constitution. The **Dillon Rule** states that municipalities only have the authority expressly granted to them by State-enabling legislation.

Comprehensive Plans

A comprehensive plan (also known as a master plan, town plan, development plan, or general plan) is a document that provides the framework for how a community would like to grow and develop. It is a guide that helps citizens and regulators make informed decisions about a broad range of land use and development issues. In most States a comprehensive plan is not considered law. It is typically carried out through municipal regulations like zoning and subdivision. For communities without zoning, the comprehensive plan serves as a guide in planning for infrastructure or other community investments.

Municipalities are authorized to adopt comprehensive plans through State-enabling legislation. Not all states require the adoption of a comprehensive plan, but municipalities may do so if they want to develop any land use laws, such as zoning, or to participate in certain State programs. If a municipality develops a comprehensive plan, most State statutes identify the primary elements and actions a plan must include. Some communities are also required to continually review and update their comprehensive plans.

Basic elements usually included in a comprehensive plan:

1. Vision and Goals
2. Official Map
3. Land Use
4. Transportation
5. Infrastructure
6. Community Facilities
7. Housing
8. Economic Development
9. Environment

Zoning Regulations

Zoning is a commonly used regulatory tool to carry out a comprehensive plan. While some States require that a comprehensive plan be adopted if a municipality would like to enact zoning, many do not. Zoning is the most significant power given to the States for managing land use and development. Zoning evolved out of urban reform movements of the early twentieth century to address overcrowding and blight and to protect existing residential and commercial neighborhoods from encroaching development. Today, zoning helps protect public and private interests, preserve critical areas, promote orderly growth, and encourage development to occur at a rate and manner that a community desires.

Zoning is the most significant power given to the States for managing land use and development.

Each State's enabling legislation provides the basic requirements or limitations of zoning. The details of how individual communities incorporate zoning into their regulatory framework vary, but the intention is always similar. Typically zoning regulations control the location, type, and density of development within a community by delineating one or more zones, or zoning districts, as depicted on a zoning map. Each district defines uses that are permitted by right (only require administrative approval by a zoning officer) and uses that are conditional (also known as special use or special exception), which require detailed review and approval by an appointed (or elected) municipal panel (board of adjustment, development review board, zoning hearing board, etc.) to ensure there are no detrimental effects on the community. This type of zoning is called Euclidean zoning and is the most commonly used approach in the United States.

The State statute typically provides a basic set of provisions for zoning regulations, but their implementation varies greatly from one community to the next. There are other more flexible approaches to zoning, which include performance zoning, incentive zoning, or form-based zoning. Municipalities often combine aspects from the different approaches to develop zoning regulations that best reflect the desires of the community.

Euclidean zoning codes are the most commonly used in the United States and are characterized by the division of land into one or more designated zones or zoning districts, each with specified dimensional standards (e.g. lot size, building height) and allowed uses (e.g. residential, commercial).

Performance zoning provides a more flexible approach to conventional zoning by evaluating each individual development on its impact rather than by its use. Review parameters are based on goal-oriented criteria for different types of development.

Incentive zoning is a reward-based system that encourages desired development through incentives. While each new development must meet basic district requirements, incentives such as increased building heights, fee waivers, and reduced parking are available in exchange for other measures like installation of sidewalks or affordable housing units.

Form-based zoning focuses on the form or design of spaces, buildings, and streets rather than their use or function, and use graphics as well as text to illustrate what should be done. For an example, see Arlington, VA's, Columbia Pike Form-Based Code: http://www.arlingtonva.us/departments/CPHD/forums/columbia/current/CPHDForumsColumbiaCurrentCurrentStatus.aspx00.

Regardless of approach, most zoning has a procedure for granting variances (exceptions) to the zoning regulations (e.g. when the existing or proposed use cannot conform to regulations standards currently in place). Variances differ considerably but are usually triggered by an unnecessary hardship caused by the special conditions existing on a lot. Some communities view variances as a routine matter, while others see variances as highly uncommon exceptions.

Subdivision Regulations

Subdivision regulations provide the procedures and standards for dividing a parcel of land into smaller parcels for sale, development, or lease. Most State statutes identify the primary provisions a subdivision must include. As with zoning, subdivision regulation is a land use control commonly used to guide residential development as envisioned in a community's plan. Subdivision regulations can exist without comprehensive plans or zoning, but are most effective when tied to related dimensional and density requirements typically found in zoning regulations.

Subdivision regulations provide the procedures and standards for dividing a parcel of land into smaller parcels for sale, development, or lease.

The regulations governing the division of land are different from zoning regulations. While zoning regulations address the type and density of development allowed within a community, subdivision regulations address the quality of development. They address how land is divided up to accommodate different land uses, the availability of public services, and the layout of the site. The way in which lands are divided plays a key role in the orderly development of a community. Once land is divided into lots and streets are laid out, development patterns are set.

Zoning regulations address the type and density of development. Subdivision regulations address the quality of development.

Properly administered subdivision regulations can often be more effective in achieving planning goals than zoning ordinances. Failure to plan for the subdivision of land can result in increased tax burdens, unnecessary extension of utilities, traffic congestion, overburdened schools, health hazards caused by inadequate waste water treatment facilities, and a loss of community character.

Organization, Implementation, and Enforcement

Each State's enabling legislation provides the authority, organizational structure, and procedures to implement and enforce laws. This can vary from State to State, but in general each municipality is governed by an elected board of officials. They are fully empowered to act on most issues and are generally referred to as the municipality's "legislative body." There are other elected or appointed municipal officers whose duties are specified in law; these may include manager/supervisor, clerk, listers/assessors, zoning administrator, treasurer, constables, and others.

While it is typically the responsibility of the local legislative body to approve comprehensive plans and other municipal planning documents in each municipality, it is the role of an appointed (or elected, in some cases) planning commission or board to prepare, maintain, and amend such documents. Planning commissions are typically made up of a small group of volunteer citizens that provide recommendations to the legislative body. They are charged with controlling growth, promoting economic health, and improving the overall quality of life for all citizens. The exact organization and duties of a planning commission vary, depending on where it is, but generally the commission meets on a regular basis to consider issues of interest, and, in some cases, permit applications.

A zoning hearing board is the municipal body that is authorized and delegated to uphold and interpret the zoning and subdivision regulations developed by the planning commission. The board reviews complete applications for proposed projects at public hearings. Such reviews may be for site plans, conditional uses (special exceptions), variance requests, and/or subdivisions. The board is also authorized to hear appeals of decisions by the zoning administrator.

It is the responsibility of a zoning administrator, code enforcement officer, or similar administrative officer employed by the municipality to interpret, administer, and enforce the local bylaws and regulations prepared by the planning commission and adopted by the legislative body. No land development may commence until all required permits are issued by the administrative officer. The following chart provides a general overview of the roles and responsibilities of individuals and groups involved in the planning process. The names and responsibilities can vary by State and by municipality.

Planning Responsibilities

Legislative Body[1] (Selectboard, Supervisors, Councilpersons, Trustees, etc.)

- Appoint and remove commission/board members
- Hire staff
- Adopt/amend any ordinance
- Approve comprehensive plan and ordinances
- Adjudicate subdivision applications of importance
- Approve capital budget and other expenditures
- Adjudicate conditional use applications

Commissions/Boards[2]

- Planning Commission
  - Draft zoning and subdivision ordinances, including amendments
  - Advise on subdivision applications
  - Prepare comprehensive plan and subsequent updates
  - Prepare other studies and capital budgets
- Zoning Hearing Board (Development Review Board, Board of Zoning Appeals, etc.)
  - Review conditional uses (special exceptions) and variances
  - Review subdivision applications
  - Review appeals for zoning permit or notice of violation
  - Advise on ordinances, comprehensive plan
- Other Boards/Commissions (Environmental Advisory Council, Design Review Board, Historic Resources Commission, Park and Recreation Board, Conservation Commission, Economic Advisory Board, Shade Tree Commission, etc.)
  - Advise on ordinances, comprehensive plan
  - Advise on subdivision applications
  - Prepare and administer specific plans and programs

Staff[3] (Code Enforcement Officer, Zoning Administrator, Zoning Inspector, etc.)

- Conduct enforcement
- Advise elected officials
- Staff commissions/boards
- Issue zoning permits
- Issue letters of violation
- Interface with the public

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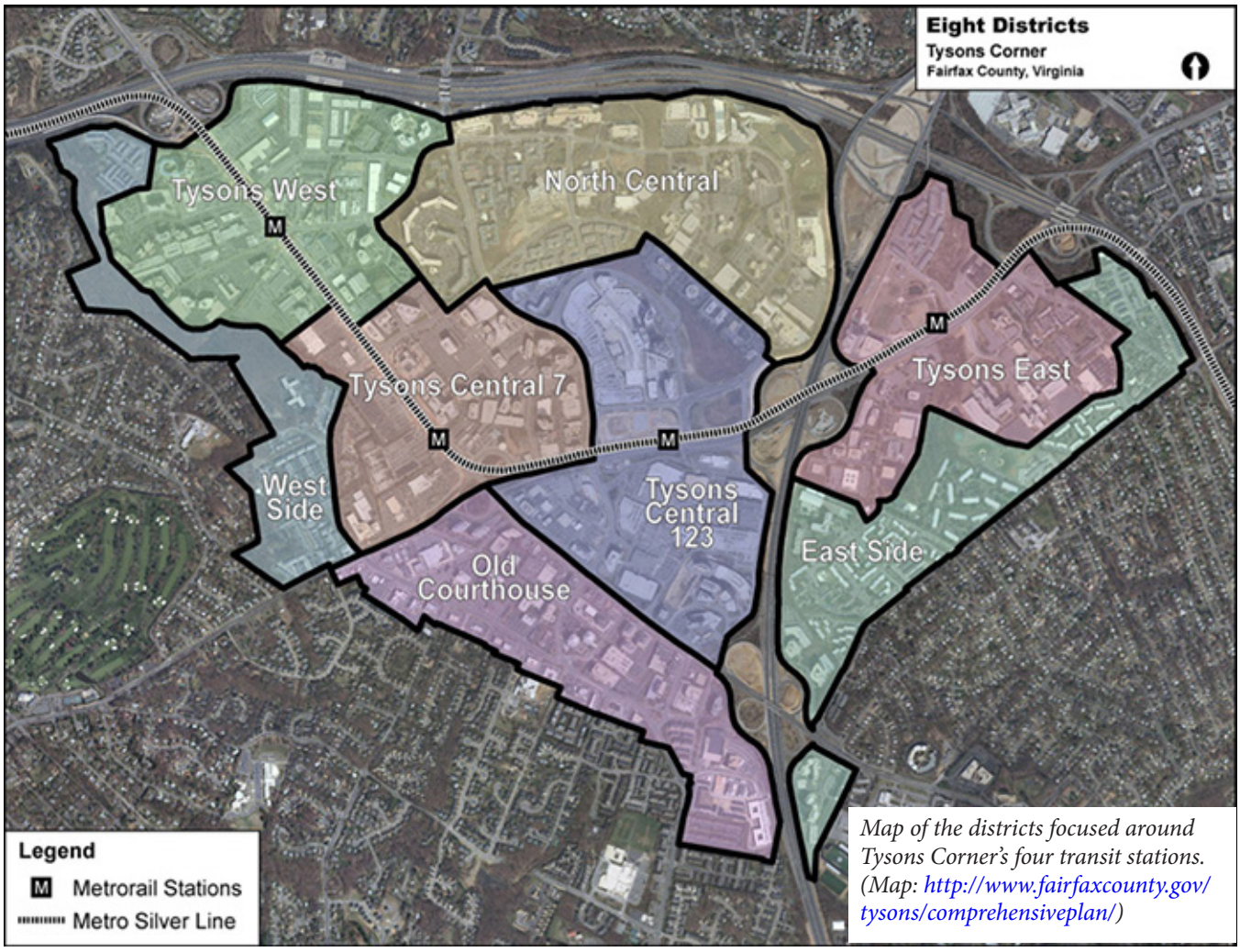
[1] Decisions of legislative body usually appealed to State appeals court
[2] Decisions of commissions/boards usually appealed to State appeals court
[3] Decisions of staff usually appealed to zoning hearing board

Case Study — Transforming Tysons: Tysons Corner Urban Center Comprehensive Plan, Fairfax County, Virginia June 22, 2010

Transforming Tysons is an award-winning example of how a municipality can prepare a comprehensive plan to evoke change in their development patterns. In 1960, Tysons Corner was a rural crossroad. Today, it is the 12th largest employment center in the Nation with 17,000 residents and 100,000 jobs. With the projection of 100,000 residents and 200,000 jobs by the year 2050, there was a need to create a new comprehensive plan that transformed the sprawling office/commercial center into a sustainable downtown. This was an unprecedented change for this quintessential edge city—a growth area outside of a traditional urban center where development of businesses, shopping centers, and entertainment has sprung up due to its location near a major highway interchange or freeway exit.

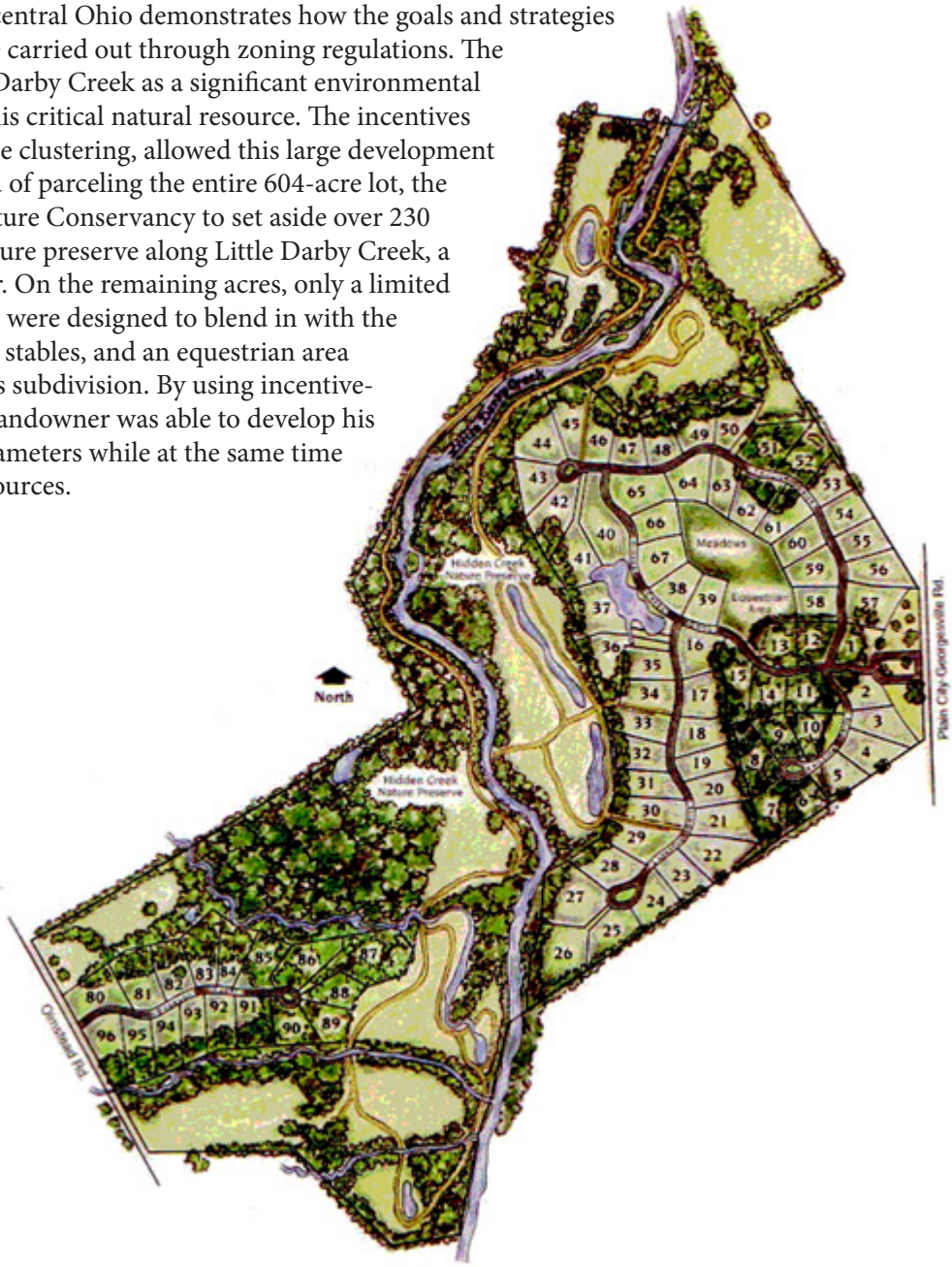
Transforming Tysons envisions a series of livable urban districts focused around four new transit stations, 20 percent of new development reserved for moderate-income housing, a tiered approach to density, an urban grid of streets, innovative stormwater management facilities, and a comprehensive network of parks and open space. As development occurs, these districts will be linked by greenways that will create an accessible system for casual recreation, allow residents the option to walk or bike to their destinations, and develop critical open space. The plan was developed over several years through an inclusive planning process. More than 2,000 people participated in over 50 public meetings, workshops, and events. The resulting comprehensive plan provides a blueprint for sound planning and future development within the city.



Map of the districts focused around Tysons Corner's four transit stations. (Map: http://www.fairfaxcounty.gov/tysons/comprehensiveplan/)

Case Study — Hidden Creek at the Darby

Hidden Creek at the Darby in central Ohio demonstrates how the goals and strategies of a comprehensive plan can be carried out through zoning regulations. The comprehensive plan identifies Darby Creek as a significant environmental feature and seeks to preserve this critical natural resource. The incentives offered in zoning, which include clustering, allowed this large development to accomplish this goal. Instead of parceling the entire 604-acre lot, the developer worked with The Nature Conservancy to set aside over 230 acres as a protected, private nature preserve along Little Darby Creek, a National Wild and Scenic River. On the remaining acres, only a limited number of clustered home sites were designed to blend in with the natural settings. Walking trails, stables, and an equestrian area were also incorporated into this subdivision. By using incentive-based zoning (clustering), the landowner was able to develop his property within regulatory parameters while at the same time preserve important natural resources.



Site map of Hidden Creek at the Darby, a residential community located just west of Columbus, OH. (Map: Hidden Creek at the Darby)

Case Study — Bucks County Performance Zoning Model Ordinance

This performance zoning model ordinance, passed in Bucks County (Pennsylvania) in 1996, has the primary purpose of protecting the environment and the secondary purpose of encouraging flexibility in subdivision design. The primary objective is achieved by limiting the amount of development intrusion on certain natural resources. The subdivision ordinance also contains three main performance criteria that a project must meet: minimum open space, maximum density, and maximum impervious surface. The intensity of subdivision development is determined by on-site evaluation and by the degree of compliance with the three performance criteria. Flexibility in the design of residential developments is also accomplished by permitting a full range of dwelling unit types.

Bucks County, Pennsylvania, courthouse.

Bucks County, Pennsylvania, Performance Zoning Model Ordinance:
http://www.smartcommunities.ncat.org/codes/bucks.shtml

Relevant Factsheets

P1 – *An American History of Planning* – Provides an overview of the formative years of planning and discusses these influences on the practice of modern planning.

L1 – *Principles of Planning* – Provides an overview of why we plan, the elements of planning, and the importance of public support during the process.

L2 – *Scales of Planning: From Landscapes to Ecosystems* – Helps us understand the levels and complexities of planning.

N3 – *Regulatory Approaches to Protecting Natural Resources* – Demonstrates how planning approaches are used to protect natural resources.

N7 – *Minimizing Parcelization, Fragmentation, and Sprawl* – Defines these three terms and provides mechanisms of planning that can be used to manage undesirable development.

Resources

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Pedestrian and Bicycle Information Center. http://www.pedbikeinfo.org/. (17 September 2014).

Transforming Tysons: Tysons Corner Urban Center Comprehensive Plan. Department of Planning and Zoning, Fairfax County, Virginia. http://www.fairfaxcounty.gov/tysons/comprehensiveplan/. (17 September 2014).

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P rinciples, people, and policies
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A pproaches
N atural resource planning tools

L4: The Power of Collaboration in Community Planning

Involving diverse partners in the planning process results in greater buy-in and outcomes that address greater needs.

Overview

Collaborative planning means integrating ideas, opinions, and objectives to resolve common issues. It is a process of communication, problem solving, and decisionmaking. Involving diverse partners in the planning process results in greater buy-in and outcomes that address greater needs. This factsheet provides an overview of concepts and methods that resource professionals can use to ensure they are engaged early in the planning process, have a better understanding of the scales of planning, use science to build support, overcome barriers, and are aware of the skills necessary to collaborate effectively.

What is Collaboration?

Collaboration is what occurs when a group of people come together to deal with common problems, work through conflicts, and develop strategies and solutions to accomplish mutual goals and objectives. It is a process that works best when it is based on a specific place, cooperative in nature, includes multiple parties, and is grounded in highly relevant information. Successful collaboration must cross boundaries defined by geography, jurisdictions, organizational interests, and perceptions.

Collaboration involves building relationships among individuals and groups, agencies, and organizations. The roots of collaboration are based in the planning concept of neighborhoods and communities. Whether the process is one of private-public partnerships, alternative dispute resolution, collaborative stewardship, civic environmentalism, or sustainable development, collaboration creates opportunities for meaningful involvement. Resource management is improved because of the insight that can be gained by the diversity of relationships formed during collaboration.

Collaboration can provide the type of social interaction that often deepens learning while providing the support and synergy necessary to creatively solve complex problems. The presence of the government as a partner can provide resources, incentives, and opportunities that are important to the collective effort.

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How Collaboration Works

Building Support

Solutions to community-scale problems require a truly collaborative process. This process begins by building understanding through sharing information and engaging the public. Gathering input from participants is just as important as sharing scientific information. By providing information to political leaders and building relationships with key decisionmakers and stakeholders, the collaborative process builds public and political support, which is critical if the plan is to be successfully carried out.

Collaboration begins by sharing information and engaging the public.

Useful Tool

Collaboration is not the goal of successful planning but rather a useful tool in the process. It builds understanding by fostering the exchange of information and ideas, and provides mechanisms for effective decisionmaking. Wondolleck and Yaffee (2000) describe eight keys they believe lead to successful collaborative efforts:

- Builds on common ground
- Creates new opportunities for interaction
- Employs meaningful, effective, and collaborative processes
- Focuses on problems in a new way
- Fosters a sense of responsibility, ownership, and commitment
- Recognizes that partnerships are made up of people, not institutions
- Moves forward through proactive and entrepreneurial behavior
- Mobilizes support and resources

The Challenge of Collaboration

Working Together

Collaboration requires individuals and groups to work, interact in human relationships, and spend limited energy and resources on activities that may not produce benefits. Dealing with human behavior is a fundamental challenge, so it is important to develop good people skills and to understand that it is okay to agree to disagree.

Collaboration requires people to interact with others and develop good people skills. (Photo: Eileen Hornbaker, U.S. Fish and Wildlife Service)

Barriers

Understanding the barriers to collaboration can help minimize problems. Barriers tend to fall into one of two categories: institutions and structures, or attitudes and perceptions.

- Institutional and structural barriers include legislative and judicial decisionmaking that can be competitive and adversarial. The fragmentation of power, authority, and interests, especially within government, can make collaboration particularly difficult. This may be compounded by conflicting goals, inflexible policies and procedures, and constrained resources.
- Attitudes and perceptions can create barriers when people are mistrustful, apply stereotypes to others, are afraid of commitment, and lack support. The public often has a general lack of trust in government that keeps

many people from participating. The use of stereotypes that leads to a lack of trust can prevent participation due to misconceptions about the purpose and goals of particular planning efforts or participants. Resource professionals are most impacted by fear of commitment and lack of support. Staffs within most agencies are strapped for time, and resources are stretched to their limits. As budgets are cut, so too is staff involvement in activities that may not be viewed as being directly tied to resource management.

The best way to overcome the challenges and barriers associated with collaboration is to use processes that build trust, understanding, and relationships between disparate groups day to day as well as issue by issue. It is also beneficial to establish expectations and commitments up front. More information on breaking down barriers will be provided in the next section on Approaches to Collaboration.

Overcoming Barriers

"Just as the forest grows from one seed at a time, successful programs grow one recruit at a time. Each new recruit must be made to feel special, wanted, and important."

—Minority Outreach Guide, Western State Foresters

Approaches to Collaboration

Place-based Collaboration

Most people strongly identify with a geographical place, a community, or a neighborhood. This connection can be used to initiate discussions about problems, concerns, or important issues. By creating a sense of place, resource professionals can more readily establish the common ground necessary to begin the collaborative process. Another way to capture the public's attention is to provide a local focus that people can identify with and feel good about. Watershed groups have been successful in enhancing a sense of place by taking field trips or sponsoring community events such as water festivals and river cleanups.

Establishing common ground can also be achieved by finding a shared sense of purpose such as shared problems, fears, goals, or interests. Another method is to bring compatible interests together. When working with a diverse population that does not readily share common interests or issues, negotiation may be the most effective method of crafting solutions.

Creating a Sense of Place

The Project for Public Spaces is helping communities create a sense of place through "placemaking," a multifaceted approach to planning, designing, and managing public spaces.

Resource professionals can establish a sense of place by sponsoring community events such as habitat restoration efforts.
(Photo: U.S. Fish and Wildlife Service)

The Process

It is important to understand that collaboration isn't just about the people involved; it is also about the process. Managing the process efficiently includes effective and efficient organizational structures. Make sure the process has sufficient time to allow participants to make decisions. Trying to rush the process is more likely to result in frustration and failure both in the short and long term and make participants reluctant to participate in future planning efforts. At the same time, the process must be sensitive to demands placed upon people's time.

Creating Neighbors

While many collaborative processes are initiated by adversarial situations, it is important to understand the need to transform people from enemies into neighbors, thus taking the process from a perspective of "us against them" to one of "us against the problem." Unified visions and goals provide guidance and focus and help facilitate the problem-solving process. Helping to develop these goals and interests is often one of the first steps in a collaborative process. Individual interests that are always part of any process are generally interconnected. Thus, in order for individuals to achieve their own goals and interest, they must work together to achieve a unified vision and goals.

Commitment

Ownership of the problem and commitment to the process are necessary for all successful collaborative partnerships. By establishing a direct and personal connection between individuals and the problem, people will pay attention and will be compelled to find resolution. Commitment is also key to a successful process. Wondolleck and Yaffee (2000) found that "commitment stood out as the single most significant difference between successful and unsuccessful negotiations." Agencies can show commitment by having consistent staffing throughout the process.

Getting Started

Many tools can be used to enhance participation and collaboration. To effectively collaborate, it is important to find the right media, craft the right message that will resonate with the intended audience, and persuade people in the media to send the message out. Many communities and agencies have media specialists who can help with this process by helping to define the message and identifying the best media source for getting the message out to the public. Avenues for distributing information and initiating collaboration include traditional media (print, radio, electronic); social media (Facebook, Twitter); electronic networks; public meetings; workshops; special events; surveys, brochures, and interviews; advisory committees; focus groups; and special interest groups.

Natural resource professionals can hold workshops and special events to initiate collaboration.
(Photo: Steve Hillebrand, U.S. Fish and Wildlife Service)

In this ever increasing age of electronic communication, social media sites like Facebook, LinkedIn, and Twitter are just a few examples of how people are using these sites to get the word out, initiate action, and document change. Developing a project Web site is another effective way to get the word out and keep people advised on the progress being made.

Successful collaboration also involves effective facilitation of the process. Facilitators are people who accept responsibility for helping the group achieve a common task. They are responsible to the group, not to the individuals, and their primary role is to help establish and maintain forward movement.

Diffusion of Innovations Theory

Developed by Everett Rogers, this theory describes the process by which an individual accepts or adopts an idea or product. The theory and associated model provide an initial way to identify target groups for communication purposes. For more information, see Rogers (2003).

Tips for Getting Started

- Research the community where the project or activity is planned.
- Engage a strong and involved local partner.
- Make personal contacts to get people to participate.
- Listen without being defensive.
- Follow up and meet citizen's needs. Follow through with tangible results.
- Keep good records from meetings and/or events, and be sure to keep track of new contacts.

Case Study — Chicago Wilderness Project

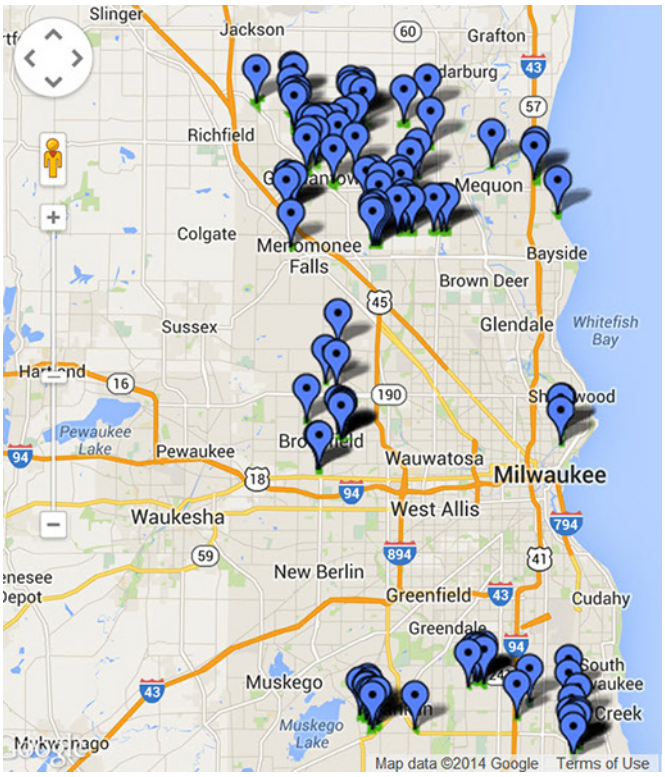
The Chicago Wilderness project is an excellent example of cooperation among Federal agencies to engage regional, State, county, and local jurisdictions and planning authorities and facilitate public-private partnerships with not-for-profit and for-profit organizations to conserve open space and involve urban residents in Forest Service programs. The Chicago Wilderness consortium consists of over 190 public and private organizations. The nature reserve is a system of forest and grassland preserves, State parks, Federal lands, county preserves, and private conservation lands that covers more than 225,000 acres in the greater Chicago region.

Chicago Wilderness: http://www.chicagowilderness.org

Case Study — Milwaukee's Greenseams® Program

The Milwaukee Metropolitan Sewerage District (MMSD) provides wastewater and flood reduction services to 1.1 million customers in 28 communities. For more than a decade, the region has invested in a massive labyrinth of deep tunnels to hold overflowing sewer water during storms so that homes stay dry and water quality remains high. The Greenseams® Program reduces future flood risk and protects water quality by purchasing and conserving properties with hydric soils near major waterways. All property sales are voluntary and all land remains as open space. Greenseams is enthusiastically supported by many of Milwaukee's civic leaders, utility customers, government officials, landowners, and conservationists in MMSD's 28 communities.

Greenseams® Program through The Conservation Fund: http://www.conservationfund.org/projects/greenseams-green-infrastructure-milwaukee/



Map showing locations of Greenseams® properties in Milwaukee County, Wisconsin. (Map: ©Google)

Relevant Factsheets

P3 – *The Role of the Natural Resource Professional in Planning* – Discusses the role resource professionals play in providing scientific information in the planning process.

L5 – *Participation with Conflict in Mind* – Once the professional is involved with various groups, this factsheet can help him or her avoid creating and/or participating in conflicts.

A4 – *Using Science to Substantiate Natural Resource Planning* – Helps resource professionals understand how science can be used to validate planning that addresses natural resource issues.

N4 – *Nonregulatory Approaches to Natural Resource Conservation* – Makes resource professionals more aware of the tools that may be available to communities and organizations.

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A pproaches
N atural resource planning tools

L5: Participation with Conflict in Mind

Successful planning of complex natural resource issues requires broad and engaged participation in the decisionmaking process.

Overview

This factsheet discusses participation and its importance in cultivating better dialogue. It recommends approaches to using participatory techniques in conflict resolution to facilitate collaborative dialogue and planning.

Participation

People who are concerned about and use parks, open space, and other public landscapes have diverse attitudes and behaviors. This is especially true in growing ethnic populations, the redevelopment of cities, and the movement of urban people to rural places. Successful planning and management of complex natural resource issues require broad and engaged participation in the decisionmaking process. Participation is a process that brings diverse people together to define critical issues, develop common goals, and exchange information and resources in the spirit of developing action plans that support diverse goals and objectives.

Planning scholars continue to argue that broad citizen participation can generate trust, credibility, and support for carrying out policy and projects. Other benefits of public participation include a better understanding of the likely costs of conflict so that conflict can be dealt with early on in the planning process. Integrating local information and needs in the planning process can lead to strong, productive partnerships.

Broad citizen participation can generate trust, credibility, and support for carrying out policy and projects. (Photo: http://www.cipast.org)

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However, increased public participation does not come without its problems. Engaging a large number of participants may lead to conflict that causes people to abandon their commitment to a project. It may increase costs due to the need for conflict resolution skills. There may be a lack of skill in communicating with nontraditional audiences or increased time and costs required for making decisions. With more involvement, there may be concerns about increased workloads and loss of decisionmaking power by organizations and agencies. Increased participation has both benefits and challenges; if done properly, however, the benefits of developing involved and supportive partners can clearly outweigh the challenges.

Cultivating Better Dialogue

In urban areas and rapidly changing rural areas, natural resource planning and management affect broader segments of society than ever before. However, surveys in different regions of the country indicate that people traditionally involved in natural resource decisionmaking are predominately middle-aged or older, well-educated, white males. Chronically underrepresented groups include the elderly, youth, women, various ethnic groups, disabled persons, the less educated, and those who are simply too busy.

Several techniques can be used to identify and involve more people. First, it's important to understand the difference between inviting and empowering. Inviting is placing a notice in the newspaper. Empowering includes such things as providing childcare and transportation, holding meetings at convenient times and locations, distributing information in understandable formats, and actually listening to and considering participants' ideas and viewpoints.

A broad range of people with a stake in the outcome should be included early, often, and throughout the planning process. Stakeholders are people who are interested in, affected by, or important in making decisions. When gathering information and making decisions, it's important to conduct true dialogue with stakeholders rather than just hold question-and-answer sessions. Dialogue is a conversation that involves meaningful speaking and listening. It is developed through two-way communications where people agree to both teach and learn. To do this, people must be able to both share and listen.

A broad range of people with a stake in the outcome should be included early, often, and throughout the planning process.

A number of methods can be used to identify stakeholders and gather information from them:

- **Stakeholder Mapping:** Groups are convened and asked to work together to draw a map of people and organizations touched by or involved in an issue. Key informants are people who know a lot about a place, thing, or other influential people.
- **Personal interviews**—face-to-face discussions with informants—can shed light on problems and opportunities and provide additional suggestions for participants.
- **Oral histories** cultivate dialogue by allowing people to explain and discuss an issue in their own words.
- **Focus groups** involve facilitated group discussions (usually 10 people or fewer) about a specific topic.
- The **charrette process** is an intense work session with ongoing participation and interaction. In a charrette, a team representing a range of disciplines forms a core group that works with community members through one-on-one and group discussions on such things as environmental mapping; assessing environmental, social, and economic conditions; framing issues; developing strategies for action; and presenting ideas in a public forum to solicit feedback.

The reality is that all of this well-intentioned work can cause or reveal conflict that is often deep seated and historical. Skillful conflict resolution techniques are often required to build useful participation, engage in effective dialogue, and move forward.

Conflict Resolution

In light of varying knowledge, attitudes, and values among stakeholders—not to mention passion and emotion—conflict resolution may be required for useful information and outcomes. Unfortunately, conflict resolution techniques are often overlooked as part of planning and other participatory processes. Conflict resolution involves the following principles:

Listening

Listening must often be defined and addressed during a collaborative conflict resolution process. Listening is not thinking about what you are going to say next, or how much you dislike an idea. Listening is keeping an open mind to the opinions and concerns of others.

Listening is keeping an open mind to the opinions and concerns of others.

Excellent Communications

Informal presentations and dialogue with the group are encouraged, speaking from the heart. It's important to strive for a free flow of accurate and understandable information. Unfortunately, for some, the most powerful strategy is to protect their position by not coming to the table to participate or, once at the table, by withholding information or thoughts.

An Inclusive, Not Exclusive, Process

Diverse viewpoints are shared and taught through discussion, field trips, presentations, and brainstorming.

Mutual Respect for All

Thoughts and ideas of all participants are respected and assumed valid until proven otherwise.

Focus on Interest, Not Position

The conflict resolution process works only when people are truthful about their interest and are able to explain both what they want and why they want it. What they want (their preferred solution) is known as a position. Why they want it (their underlying concern) is referred to as an interest.

Facilitation

Facilitators can often help groups of people better identify their interests and positions through facilitation. This process helps introduce people and groups to each other and sets rules for listening and communicating. This process can promote the flow of free and accurate information; facilitate discussion on all sides; and make sure common interests are identified, understood, and documented.

The key to conflict resolution is identifying shared interests. The process will fail if people stick to their positions and refuse to share and understand each other's interests. Those shared interests become the central criteria for generating mutual understanding, trust, and respect. Identifying shared interests is a key milestone in successful negotiations and action.

In a simple example, a volunteer organization wants to plant trees, shrubs, and flowers in a park near a school to benefit the neighborhood and the health and enjoyment of children. The local police are concerned about the impact of the new plantings on neighborhood safety, including that of the children. The two positions are 1) the planting of trees, shrubs, and flowers; and 2) protecting public safety. The shared interest is the children.

Once this is recognized, negotiations between the two parties can revolve around their common concern for children. Thus, the first step in building trust and negotiations between diverse people is to identify and acknowledge shared interests through a process of true dialogue.

The key to conflict resolution is identifying shared interests.

Identifying and accepting common interests can be difficult. Participants may not share their perspective or listen to others and may view only their answer as the right answer. Long-lasting, historical relationships can make the conflict resolution process more difficult. Participants, often with the aid of facilitators, need to be encouraged to learn about other people's interest and truly listen to their replies. Something as simple as asking a person a question ("What do you think about that?") or acknowledging a person's concern ("I understand") can change relationships and lead to meaningful discussion.

Participants need to be encouraged to explain their interests. This can be done through a number of different techniques. Taking and sharing pictures of important places and people and the thoughts behind them, sharing different perspectives on problems and opportunities, field trips led by different people, storytelling, and testimonials are all used to help identify mutual interests. Visual techniques such as "vision galleries" and photographs can sometimes help people literally "see" shared interests that would take many words to express.

Field trips led by different people help identify mutual interests in the conflict resolution process.

A Collaborative Approach to Conflict Resolution

A collaborative approach to conflict resolution brings people together to identify the problem, uses common interests to find collaborative solutions, and ultimately develops mutual action rather than just deciding who wins. The process is more complex and time consuming than facilitating group discussion in brief encounters.

Collaborative processes take time, which can be a concern of those who are required to make decisions. Accurate and understandable information is important to help separate fact from personal attitude and values. Compromise and tradeoffs are often needed for successful action. Differences in deeply engrained values that represent the worth that a person or group places on something can be difficult to resolve. Very personal and direct explanation and acknowledgement may help change deeply engrained values.

A collaborative approach to conflict resolution brings people together to identify the problem, uses common interests to find collaborative solutions, and ultimately develops mutual action rather than just deciding who wins.

Collaborative Conflict Resolution Steps	
1. Predeliberation	• *Getting Started*: Identify and contact stakeholders. Be prepared to use encouragement and persuasion if concerns about power or limitations interfere with willingness to come to the table. • *Establishing Ground Rules/Setting Agenda*: The group devises rules for communicating, making decisions, sharing information, and organizing. This is a first test of the group's ability to collaborate. • *Pursuing Joint Fact Finding*: Participants agree on what technical and other information is important to the process, as well as who will gather and present information to the group.
2. Deliberation	• *Defining the Problem(s)*: A recognized neutral party can provide an overview, but all participants should define the problem(s) in their own words based on their own perceptions and values. • *Educating, Listening, and Developing Criteria*: Parties clearly state interests (rather than positions) to each other, or a facilitator uses techniques to identify interests. Interests include reasons, needs, concerns, values, perceptions, and motivations. Shared interests become criteria for negotiating alternatives. • *Generating Alternatives*: Use brainstorming or other group techniques to invent alternative scenarios without deciding if one is better than another. Creativity is encouraged. • *Evaluating Alternatives Based on Interest*: Find ways to satisfy shared interests to reach agreement on action and successful negotiations. Discuss how agreed-upon actions might be carried out.
3. Implementation	• *Implementing Agreed-Upon Alternative(s) and Monitoring*: Ratify in writing all actions that have been agreed upon. Clarify possible partnerships. Participants may be called back to review results.

Tips for Working with Elected Officials

Developing good relationships with community officials is essential in putting "green issues" on the agenda of local government. A good strategy for starting the community decisionmaking process is to make friends and allies with elected officials, not to create enemies and conflict.

- Identify an elected official who is likely to support your ideas.
- Include elected officials early in discussions and decisionmaking.
- Understand the legislative facts and financial realities of your proposals and requests.
- Be well informed. Find out the positions of the officials before a hearing. Try to meet with officials personally before a public hearing or discussion.
- Find opportunities throughout the year to communicate the good things about you or your organization, not just at one meeting.
- Include public officials in positive volunteer and press opportunities.
- Be organized when making presentations.
- Relate the positive impact that will result from your request and state any problems it corrects.
- Be respectful, friendly, and concise.
- Listen to questions and comments, and prepare thoughtful responses.
- Provide factsheets and other concise information.
- Ask for, do not demand, officials' views and favorable consideration.
- Use letters to follow up on unresolved issues and thank officials for their support.

Case Study — U.S. Institute for Environmental Conflict Resolution: Sierra National Forest Dinkey Project Planning Forum

[From the U.S. Institute for Environmental Conflict Resolution
Web site: http://www.udall.gov/OurPrograms/Institute/ProjectCaseSummary.aspx?Project=1349]

National forests in California's Sierra Nevada Mountains face continued controversies over the effects of timber harvest on old-growth forests and their wildlife. To determine whether forested landscapes can be managed to maintain essential components and still support timber harvest and other uses, the Sierra National Forest teamed with the Forest Service Pacific Southwest Research Station in a proposed management study called the Kings River Project. Since its inception, the project was faced with numerous administrative and legal challenges from conservation groups.

The Dinkey Project Planning Forum is one example of a collaborative forest landscape restoration program. (Photo: http://www.udall.gov/OurPrograms/Institute/ProjectCaseSummaries.aspx)

With the help of the U.S. Institute for Environmental Conflict Resolution, the Dinkey Project Planning Forum convened to develop a 154,000-acre project as a subset of the Kings River Project. The planning forum embraced representatives from all stakeholder interests, including forest industry, conservation, wildlife, fire safety, and adjacent landowners. The forum's overall goal was to design and carry out vegetative treatments such as controlled burns, thinning, and watershed restoration. It was hoped that the treatments would restore a healthy forest structure and reduce fire risk to more than 5,000 homes, while supporting ecosystem functions and addressing stakeholder interests for both business and resource conservation.

A broad range of participants helped bring needed expertise and unique problem-solving abilities. Through the process, participants committed to listening, thinking outside the box, and working together to achieve agreement. Through joint fact finding, forum participants were able to agree on fundamental science issues and provide a sound, understandable framework for making decisions.

Credible and independent science and information were keys to the success of the planning forum. Scientific experts were approved by the planning forum and participated in meetings. They were available throughout the process to help with negotiations. Field trips and site visits helped achieve forum success. Facilitation by a third-party neutral entity helped create trust, normalize the conflict, and develop an environment conducive to problem solving. The forum reached agreement on a proposed action and its implementation, which focused on the issues of public and fire fighter safety, managing Pacific Fisher and Spotted Owl habitat, and restoring forest structure and fire resiliency.

The Dinkey Project Planning Forum is one example of a collaborative forest landscape restoration program.

Relevant Factsheets

P3 – *The Role of the Natural Resource Professional in Planning* – Natural resource professionals engaged in resource planning are often involved in conflict and should understand the basic points of conflict resolution.

P4 – *Developing and Measuring Effective Local Policy* – When assessing policy, it is important to consider the degree of conflict that can result from implementing the policy, whether the policy can stand up to scrutiny, and whether conflict related to it can be overcome.

L4 – *The Power of Collaboration in Community Planning* – A primary objective of conflict resolution is to build collaboration and provide a process for better dialogue and cooperation.

A4 – *Using Science to Substantiate Natural Resource Planning* – Conflict related to natural resource planning can often be resolved using science-based information.

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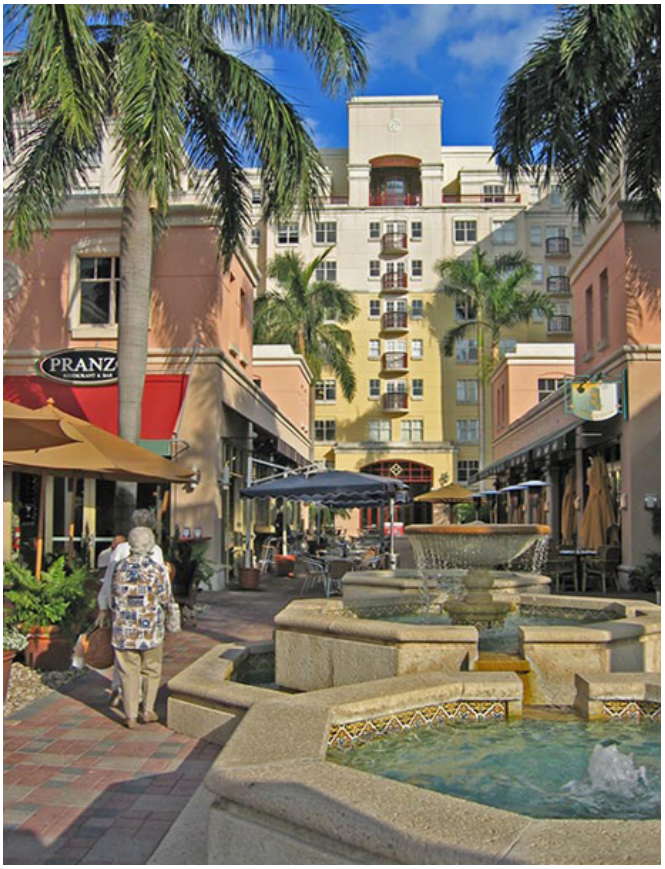
A1: Using Smart Growth Principles to Plan Sustainable Communities

Overview

This factsheet introduces the principles and strategies of "smart growth," a philosophy that planners, architects, and developers use to create communities that are walkable, affordable, and offer opportunities for residents to work and shop locally. Communities commonly use smart growth initiatives to avoid or alleviate the negative consequences of sprawl. This factsheet discusses how these approaches can be used to manage growth in concert with conservation, ecology, and quality-of-life values. Visit the EPA Smart Growth Illustrated Web site for visual examples of smart growth techniques being used throughout the United States.



A palm tree-lined pedestrian plaza leads to the entrance of an apartment building at the center of Mizner Park in Boca Raton, FL. (Photo: http://epa.gov)

"At the heart of the American dream is the simple hope that each of us can choose to live in a neighborhood that is beautiful, safe, affordable, and easy to get around. Smart growth does just that. Smart growth creates healthy communities with strong local businesses. Smart growth creates neighborhoods with schools and shops nearby and low-cost ways to get around for all our citizens. Smart growth creates jobs that pay well and reinforces the foundations of our economy. Americans want to make their neighborhoods great, and smart growth strategies help make that dream a reality."

—Smart Growth America
http://www.smartgrowthamerica.org

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What is Smart Growth?

In the 21st century, smart growth has emerged as a key directive and guiding philosophy for local, regional, and statewide land use planning and policy making. National organizations have provided leadership and technical support for carrying out smart growth initiatives throughout the United States. These organizations include the American Planning Association and its Growing Smart program as well as the International City/County Management Association (ICMA), sponsor of the Smart Growth Network.

The term "smart growth" emerged as a response to poorly planned sprawl and uncoordinated development. Smart growth concepts and principles place a high priority on the goal of livable communities where land uses have been strategically located to promote compact development and take advantage of existing transportation networks and public infrastructure.

Smart growth recognizes the value of interconnected and walkable neighborhoods near schools, services, and shops. Smart growth calls for designing commercial developments that are tailored to the scale of a community, planning development on previously undeveloped land, and concentrating mixed-use development projects in growth centers that are walkable and served by public transportation. This type of design is also known as New Urbanism. Another key element of smart growth is protecting and providing open spaces, natural areas, and working landscapes for forestry and agriculture.

Smart Growth Principles

There is general agreement among planning professionals as to what comprises smart growth. The ICMA/Smart Growth Network publication *Getting to Smart Growth* sets forth 10 principles for smart growth:

1. Mix land uses
2. Take advantage of compact building design
3. Create a range of housing opportunities and choices
4. Create walkable communities
5. Foster distinctive, attractive communities with a strong sense of place
6. Preserve open space, farmland, natural beauty, and critical environmental areas
7. Strengthen and direct development toward existing communities
8. Provide a variety of transportation choices
9. Make development decisions predictable, fair, and cost effective
10. Encourage community and stakeholder collaboration in development decisions

These principles provide the basis for consensus-driven planning decisions that reflect the unique cultural, historic, aesthetic, and landscape characteristics of a particular community or region. The intent is to promote healthy communities that are economically vibrant and place a high value on providing opportunities for appropriate housing, jobs, and recreation to all its citizens. Another key component of smart growth is the recognition that the economic realities and capital budgeting process of a municipality (or State and region) are key determinants in land use development.

Provide Transportation Choices: A trail built on old railroad tracks runs through green space alongside the development. This provides easy access to neighboring areas for pedestrians and cyclists. (Photo: http://epa.gov)

Walkable Communities: A community park centrally located near town homes provides a safe place for children to play near their homes. (Photo: http://epa.gov)

A Note Regarding Smart Growth and Green Infrastructure (see Factsheet A3)

Green infrastructure (an interconnected network of open spaces and natural areas that provide ecosystem services, stormwater functions, and landscape values to a community) can be an integral component of planning for smart growth. Smart growth relies, in part, on identifying and including open spaces and working landscapes as part of an overall approach to managing growth and development. A plan for green infrastructure, by protecting valuable resources and recognizing their functional values, promotes smart growth by delineating those areas where development should **not** occur.

Smart Growth Strategies

A number of specific strategies are being employed at the local, State, and regional level to incorporate smart growth principles. A sampling of these strategies includes these:

Complete Streets

The complete streets methodology is based on redeveloping city and town thoroughfares with multiple transportation modes (pedestrian, bicycle, vehicular, and mass transit) and community character as core elements. Complete streets incorporate key smart growth principles such as walkable environments and traffic calming to promote livable neighborhoods.

Transportation-Oriented Development

Governments can promote smart growth by funding or supporting infrastructure and land use planning that creates compact, walkable, mixed-use districts around commuter rail stations.

Overlay Districts

Creating specific overlay districts or zones as part of a community's zoning ordinance can acknowledge, promote, and protect valued local resources such as historic villages and downtowns, scenic hillsides and ridgelines, and critical natural areas.

Planned Unit Development

Planned Unit Development is an effective tool in promoting mixed uses and creative design solutions for further development of sites in an urban area. The land use ordinance can set forth areas of flexibility that allow a Zoning Commission or Development Review Board to waive certain requirements. Incentives such as density bonuses can be awarded to developers who include affordable or senior housing units in the overall development plan.

Growth Centers

A number of States have enacted growth center legislation that includes incentives for municipalities that delineate specific areas where growth can and should occur. Growth centers often include the goal of focusing a town or region's future mixed-use development in compact, walkable land use patterns with access to existing infrastructure and public transit. Growth centers concentrate future growth in appropriate locations; this in turn protects open spaces and natural resources from unwarranted development impacts.

Brownfield and Greyfield Development

Promoting the redevelopment of brownfields and greyfields (paved over areas, derelict sites such as abandoned shopping centers) often promotes development of urban sites while inhibiting sprawl elsewhere in a town or city.

Transfer of Development Rights

Communities can protect important open spaces, natural areas, and working landscapes by adopting a transfer of development rights provision in the town's land use code. This allows landowners to sell or transfer the development capabilities of one parcel, worthy of protection, to another parcel in the municipality where development is preferred.

Adaptive Reuse

Communities lose part of their historic fabric forever when historic buildings languish from neglect or, even worse, are demolished. Adopting preservation ordinances can facilitate the revitalization of historic properties for new uses. This is a tool that can provide a framework as well as incentives for adaptive reuse while setting out a process for avoiding the demolition of valued resources, which contribute to community character and a sense of place.

A former metal-can manufacturing facility along the Baltimore, MD, waterfront has been converted into the Can Company, a 200,000-square-foot vibrant, mixed-use retail and office complex. (Photo: http://epa.gov)

The historic Elitch Theater in Denver, CO, is being restored as a performance arts space. Historic preservation and the arts create a vibrant neighborhood. (Photo: http://epa.gov)

Case Study — King Farm, Rockville, Maryland

King Farm is a community designed with many of the principles of New Urbanism in mind. This area contains 3,200 homes on 430 acres, making the gross residential density more than three times the city of Rockville. To support the potential population, over 2.2 million square feet of commercial space is included near the existing Metro station, and the mixed-use Village Center is designed to include 120,000 square feet of neighborhood retail space along with 49 apartment units and a stop for a possible future Transitway. Easy access to a variety of transportation options is available. These include the Metro, which provides rail access to Rockville, Bethesda, and much of the Washington metropolitan area; shuttle buses that run between the Metro station and King Farm; a series of bike paths that connect parks, schools, and the Metro; and an overall environment designed for pedestrians. Over one-quarter of the land in the community is reserved for parks and open space. King Farm contains numerous pocket parks, squares, commons, and community spaces, along with a 5-acre heritage park and two city parks (12 and 28 acres) that provide recreation facilities for the community. In 2001, King Farm won a Charter Award from the Congress for New Urbanism.

For more information about King Farm, visit their Web site at: http://kingfarm.com.

This view of the King Farm community illustrates how the population density rises from the single family homes in the front, to town homes, to apartments that are closest to the Metro station. (Photo: http://epa.gov)

Case Study — Old North St. Louis Revitalization Initiative

In 1981, after many years of decline, the downtown neighborhood of Old North St. Louis was embraced by a group of citizens for a recovery effort. The residents, business owners, and community leaders formed the Old North St. Louis Restoration Group to undertake the revitalization effort. The group sought out financing from a variety of sources, including block grants, historic tax credits, affordable housing financing, and donations. The group substantially improved the neighborhood through a variety of projects—establishing a range of housing options that incorporated reuse of abandoned historic buildings and development on vacant lots; carrying out streetscape enhancement projects that create safer options for pedestrians, including new sidewalks, benches, street trees, and streetlights; and establishing community gardens and a food co-op. Their smart growth efforts have reversed a 50-year trend of migration out of the neighborhood and have led to a population increase of 28 percent over the last decade.

For more information about Old North St. Louis, visit their Web site at: http://onsl.org/.

View of Old North St. Louis looking south down N. 14th Street at part of the Crown Square project that renovated 27 vacant historic buildings. (Photo: http://onsl.org)

New light poles get installed in Old North St. Louis on N. 14th Street. (Photo: http://onsl.org)

Relevant Factsheets

A2 – *The Power of Green in Community Development* – Defines the relationship between planning and land use and reviews how the concept of "place" fits into the planning process.

A3 – *Managing Stormwater with Green Infrastructure* – Provides an overview of principles and components, and examples of how communities are using green infrastructure to address stormwater issues.

N3 – *Regulatory Approaches to Protecting Natural Resources* – Demonstrates how planning approaches are used to protect natural resources.

N4 – *Nonregulatory Approaches to Natural Resource Conservation* – Summarizes nonregulatory tools and how they can be used for preservation or conservation.

N7 – *Minimizing Parcelization, Fragmentation, and Sprawl* – Demonstrates how mechanisms of planning can be used to manage undesirable development through the use of smart growth principles.

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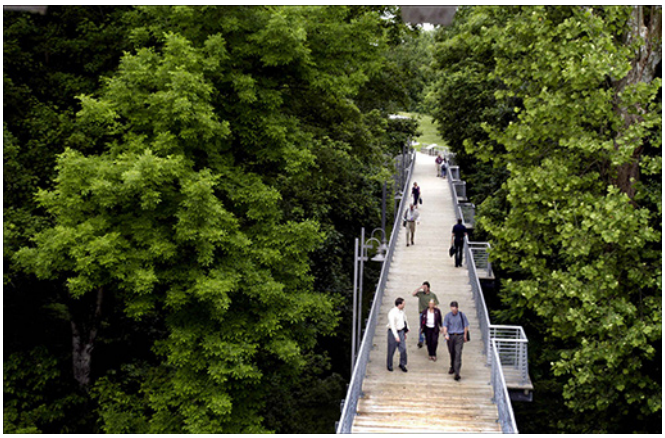
A pproaches
N atural resource planning tools

A2: The Power of Green in Community Development



Our emotional connection to nature can be a powerful motivator for integrating natural resources into community planning and development.

Overview

This factsheet defines the relationship between green infrastructure and community development. It discusses current thinking related to community, community development, and civic environmentalism. It highlights how our emotional connection to nature and other ties to the environment can become powerful motivators for integrating natural resources more fully into the planning and community development process.

The Importance of Nature in Comprehensive Planning

In the 1860s landscape architect Frederick Law Olmstead recognized the economic, social, and environmental benefits of nature to municipalities and elevated the importance of parks and open spaces in his community planning designs. His concepts were later built upon by landscape architects and planners such as Ian McHarg, who advocated the importance of designing with nature and environmental planning in the 1960s.

It's important to consider natural resources in comprehensive plans and regulatory tools such as zoning ordinances because of the ecosystem services that nature provides to communities. Today the idea of "green infrastructure" is used to champion the importance of ecosystem processes and services in community planning. This concept maintains that planning and funding for ecological well-being is as critical to individual and community health as planning and funding the traditional grey infrastructure of streets, sewers, and utilities. In 1991, sociologist Kenneth Wilkinson offered this thought:

"Social and individual well-being cannot be achieved except in ways that also promote ecological well-being. Ecological well-being, which in the literal sense means the well-being of the house of civilization, refers explicitly to natural and other conditions that support and sustain human life. It is not accurate or appropriate to treat the environment as though it is somehow separate from the social life it supports. An active interdependency characterizes the relationship between social life and its surroundings. References to human and environmental separation cannot be justified on any grounds today, as they might have been in the past."

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Incorporating green infrastructure when planning a community is as critical to individual and community health as planning streets, sewers, and utilities.

Community

There are many definitions surrounding the concept of community as a fabric of local life, involving such things as family; supporting institutions (school, church, health care, local government, financial institutions); shared territory; social interaction; a common life; collective action; and a healthy environment. Community has been defined as an aggregate of people sharing a common interest in a particular locality. Those spatial and interactional qualities suggest the idea of "experience reinforced by space." Thus, community is not a place; it is a place-oriented process. In this process, the locale's environmental qualities play important roles in the health, interaction, and capacity of community.

For many sociologists, the foundation of community is social interaction—individuals and groups working together to pursue their common goals. From an interactionist's perspective, social interaction is what creates the fabric of community and allows the emergence and development of community.

Community Development

People concerned with the development of community are interested in land use, transportation, public safety, public health, education, enterprise development, leadership, and environmental quality—all components of comprehensive planning. They are also interested in positive and useful interaction among residents, institutions, and the environment. Although economic goals are often important, community development is more than economics. It must include experiences from the successes and failures of residents working to strengthen themselves and their community. The ability of local government and organizations to empower and maintain cooperation and communication can help people and communities gain this experience.

Community development also depends on people developing a shared concept of improvement of a place. A place is improved in economic and other realities when its people are empowered through skills and experiences, especially when they work toward common goals. A healthy, accessible natural environment and the planning and management issues that surround it support progressive community development work. For those reasons, it's important to include "green" considerations in community development.

Green Infrastructure as a Social Element: Supporting the Importance of Place in Community

In addition to supporting the environmental, human health, economic, educational, youth, safety, and civility values discussed by many authors, the natural environment also plays a significant role in the healthy and successful social lives of people by providing shared and structured symbols. Historical buildings and landscapes, monuments, trees, and hills are examples of symbols that help ground people in their everyday lives. They create feelings of identification and belonging that are important to enjoyment and well-being. As development and other changes occur, those symbols provide residents with a consistent sense of place and comfort. The relationship between people and symbols can invoke pride, attract outside attention, and stimulate economic activity.

Trees, parks, and other components of nature become even more powerful as social symbols when people perceive them to be part of a neighborhood or other social function, especially those involving family, home, play, love, health, learning, and equality. Strengthening people's relationship with their natural environment helps build a stronger connection to a place. Because community is a place-oriented process, the connection between people and nature can be a powerful force that supports ecologically sound planning. The value of trees and nature is an important consideration when planning community development strategies. Natural resource assessments are thus a useful tool for better understanding and planning for community development.

Strengthening people's relationship with their natural environment helps build a stronger connection to a place.

Nature and Community Capacity: A Stepping Stone in Community Development

Community capacity is defined as the strengths and assets that community members, both individually and collectively, bring to a cause. It is related to the concept of organizational capacity, or the ability to do meaningful work. Building community capacity, or the ability of the people of a place to work together toward common goals, is one critical stepping stone in community development. As people's public activity and experiences increase, so do levels of community capacity. The degree to which community members enjoy nature and interact with their landscapes and with each other is important in building community capacity.

Public landscapes are more effective at building community capacity and meeting the needs of local citizens when those citizens are involved in the decisionmaking and planning phases of designs and projects in those landscapes. Tree planting and other highly participatory environmental projects can promote social structure and organization even in the most deteriorated neighborhoods. They can build and maintain social interaction by creating and involving block clubs, neighborhood associations, church groups, and public and private partnerships. The degree to which people are informed and involved in docent programs, tree plantings, environmental planning, environmental restoration, and other volunteer work builds capacity and boosts the potential for community development by increasing public knowledge, networking, and experiences.

Many case studies of inner-city projects support using the green infrastructure of nature to build community capacity in community development efforts. Organizations such as Philadelphia Green, Trees Atlanta, Friends of the San Francisco Urban Forest, Los Angeles Tree People, and Tree Pittsburgh have repeatedly used environmental planning and projects, which also support healthy neighborhoods and communities. These efforts help rebuild the sense and capacity of community and ameliorate the effects of drugs, crime, violence, apathy, and despair in seemingly hopeless neighborhood settings.

Tree planting can build and maintain social interactions by involving community members.
(Photo: Phillip Rodbell, U.S. Forest Service)

The Simple Act of Planting a Tree

Andy Lipkis of Los Angeles Tree People shared this thought on the simple act of planting a tree: "Tree planting fosters community spirit and pride, bringing people together for meaningful purposes that can build the bridges and promote the understandings that bring the neighborhood together. The initial efforts of the tree planters compound themselves as others find in the trees a deeper appreciation. It is the beginning of the formation for city-wide transformation. The newly organized group can further push for bike paths; improvements in public transportation; and changes to make the area less congested, less polluted, and more livable. The simple act of planting a tree, along with more complicated environmental planning and restoration projects, have positive effects on the economic, social, and environmental elements of community. These types of actions are especially important in ignored and disenfranchised places where the battle cry of community capacity is 'celebrate any success.'"

Many case studies of inner-city projects support using the green infrastructure of nature to build community capacity in community development efforts. Organizations such as Philadelphia Green, Trees Atlanta, Friends of the San Francisco Urban Forest, Los Angeles Tree People, and Tree Pittsburgh have repeatedly used environmental planning and projects, which also support healthy neighborhoods and communities. These efforts help rebuild the sense and capacity of community and ameliorate the effects of drugs, crime, violence, apathy, and despair in seemingly hopeless neighborhood settings.

The Role of Volunteers and Civic Environmentalism

In both urban and rural places, the history of civic environmentalism is reflected in the reaction of local people to top-down decisionmaking and governance approaches. Civic environmentalism has been credited with civic renewal, community problem solving, and participatory democracy. Additional ideas that help tie environmental planning into community development are often addressed by this relatively new concept.

Concepts related to civic environmentalism include 1) working to increase collaboration among local people and organizations; and 2) developing public works projects and plans that directly engage citizens in monitoring, improving, and restoring the places in which they live.

Whether in urban or rural places, the fundamental lesson here is that environmental plans, policy, and public designs are often rejected because they do little to increase a sense of place and provide for the needs of community when those initiatives are imposed on people without their participation. There must be collective participation by local people for successful community development.

Rural places often have many of the same community development concerns as urban places, but they can be much more dependent on forests and other natural resources. In rural places, there are often long-standing economic and other community attachments to timber harvesting, natural resource extraction, recreation, and other working landscapes. Depending on many economic and environmental factors, these connections can have both positive and negative effects on the health, stabilization, and enrichment of people and places. If not approached through genuine collaboration, the relationships among people concerned about the places they live can become very heated and combative, especially when the loss of natural resources has worsened the economic and social decline of the community.

The Role of Volunteers and Civic Environmentalism

Environmental planning and projects are increasingly applied to social objectives. Consider these concepts to better integrate environmental projects into community development:

1) Community development is about the development of human relationships; it is not just about things.
2) Projects must recognize and express the values and wishes of local people.
3) Community requires interaction, and interaction requires trust, communications, and cooperation.
4) Projects must involve a commitment beyond selfish gain.
5) Community development requires that attention be given to all areas of local life.

Rural places often have many of the same community development concerns as urban places.

Community Development in Communities that Depend on Natural Resources

There are many approaches that help stabilize and develop rural communities that depend on the utilization of natural resources, but education may be key to all of them. Such approaches include the proper stewardship of family and privately owned forests, practicing sustained yield forestry and wise use of other natural resources, greater local participation in forest and natural resource related policy, providing greater job-training assistance to youth, securing local leadership in community decisionmaking and affairs, and organizing for united action.

Case Study — The Philadelphia Green Story

The Pennsylvania Horticultural Society started the Philadelphia Green Program in 1974.
(Photo: http://www.parkwaymuseumsdistrictphiladelphia.org/Museums-More/Members/31/memberid--181/)

Philadelphia has long faced urban renewal issues, poverty, disinvestment, and other problems of the American industrial city. To improve the quality of life and environment in Philadelphia neighborhoods, the Pennsylvania Horticultural Society (PHS) started the Philadelphia Green Program in 1974. PHS believed that communities could be restored and empowered by cleaning and greening programs that involved residents. PHS realized that tree planting and other civic environmental programs developed with the participation and approval of local people were a key element in urban renewal—that with a little bit of education and support, people would grab on to improve the places they live.

Philadelphia Green partners, developed through "Friends" groups and other organizations such as Tree Tenders, work with city and neighborhood organizations to address blight and economic decline by transforming urban waste land into accommodating open space. The program's partnerships have worked to plant thousands of trees, manage existing and new vacant lots, develop and preserve greenspace, revitalize parks, plant and maintain community gardens, provide training to prisoners, and provide environmental education to teachers through the Green City Teachers Program. Faced with massive city budget cuts and hundreds of declining trees, the Tree Tenders Program was started in 1993 to help educate and involve volunteers in planting and maintaining public trees. Today, the Tree Tenders program has graduated over 3,700 volunteers. Another successful project is North Philadelphia's "Ridge on the Rise" where locally organized artwork and tree plantings helped spark interest and investment in the area.

Philadelphia Green faces a number of challenges, including the "greying" of the garden community. People interested in trees and greenspace are getting older. The program is trying to revitalize its volunteer base through a Young Friends Group and the use of social media.

The civic environmental work of Philadelphia Green continues to play a crucial role in positive environmental, social, and economic change in West Philadelphia and other neighborhoods. Similar community development work is being done by Casey Trees (http://caseytrees.org/) in Washington, DC, Sustainable South Bronx (http://www.ssbx.org) in New York, and the Los Angeles Tree People (http://www.treepeople.org).

Relevant Factsheets

P1 – *An American History of Planning* – Shows how planning and regulatory policy have promoted economic, social, and environmental aspects of community development.

P5 – *Principles of Ecosystem Services* – Healthy environments provide ecosystem services. These services support social systems such as parks, open space, and economic growth, all important factors in community development.

A1 – *Using Smart Growth Principles to Plan Sustainable Communities* – These planning principles support economic, environmental, and social aspects of community development.

N2 – *Comprehensive Planning for Natural Resource Conservation* – Natural resource conservation in community development is a major goal of comprehensive planning.

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A3: Managing Stormwater with Green Infrastructure

Green infrastructure, such as this rain garden in Austria, can help manage stormwater. (Photo: http://www.epa.gov)

Overview

This factsheet discusses stormwater and its associated environmental and social costs. It highlights the use of nonstructural techniques, such as Low Impact Development, and structural techniques, such as retention basins. Both systems incorporate using nature's green infrastructure as major stormwater management tools. This factsheet also discusses best management practices (BMPs) for stormwater management and municipal stormwater ordinances.

The Importance of Green Infrastructure in Stormwater Management

In the past, most stormwater management relied on using the grey infrastructure of pipes, channels, and detention basins to move stormwater quickly offsite and into streams and other waterways. Detention basins are designed to collect and detain stormwater, releasing it quickly at predetermined rates. These impoundments drain completely soon after a storm with limited nutrient and pollutant removal. Detention basins and pipes allow most stormwater to enter streams quickly with little, if any, retention, infiltration, or evaporation of water onsite.

Today, retention basins, infiltration practices, and other structural systems are being coupled with new planning approaches to greatly reduce stormwater volumes through onsite water infiltration and evaporation. Unlike detention basins, retention basins store and retain stormwater so infiltration can occur. They use vegetation and porous soils to increase infiltration and evaporation of water onsite. In both structural and nonstructural stormwater management systems, the green infrastructure of trees and open space play an important role in retaining and infiltrating water. Trees and forests offer a more cost-effective alternative for managing stormwater onsite, compared to the costs of building and maintaining pipes and detention basins to move water offsite and into adjacent waterways.

The green infrastructure of trees and open space plays an important role in retaining and infiltrating water.

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What Is Stormwater Management?

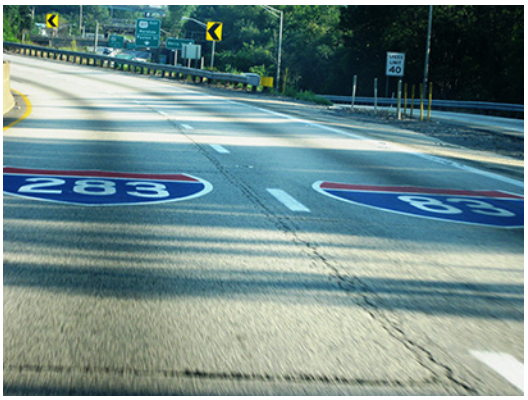
Stormwater management is the systematic control and reuse of runoff from impervious surfaces to prevent flooding, property damage, and stream degradation. Proper stormwater management activities can contribute to much-needed stream base flows and groundwater recharge in highly urbanized areas.

Conversion of Forest to Turf

In a 1980 study of the conversion from forest and leaf litter to managed turf in a North Carolina watershed conducted by Barrett Kays, the mean soil infiltration rate went from 12.4 in/hr to 4.4 in/hr. Each year 232,000 acres of new turf cover are created in the Chesapeake Bay watershed.

Stormwater Problems and Costs

Converting and developing forests and other landscapes through tree removal, grading, soil compaction, and construction impacts stream health and structure. Development affects both the quantity (volume) and quality (pollutant levels and temperature) of water entering streams and rivers by removing vegetation and the tree canopy with its buffering capabilities. Development also creates impervious surfaces. For example, from 1990 to 2000, impervious cover in the Chesapeake Bay watershed increased by 41 percent while the population grew only 8 percent.



Impervious surfaces such as asphalt prevent water from entering the soil.

Impervious surfaces are areas such as asphalt and roofs that either prevent or retard the entry of water into the soil. As impervious surfaces increase, stormwater runoff travels to streams with greater volume and speed, collecting sediment, nutrients, toxic chemicals, garbage, and other pollutants. Greater stormwater volume increases both "point" pollution from one single, discernible location and "nonpoint" pollution from dispersed, multiple sources of pollution.

As impervious surfaces increase, stormwater runoff travels to streams with greater volume and speed.

Increases in both point and nonpoint pollution sources contribute to a waterway exceeding its required Total Daily Maximum Load (TDML)—the total amount of pollution a stream or other body of water can receive without exceeding Federal water quality standards. Stream water temperatures also rise as rainwater that has traveled across parking lots and other surfaces flows into the waterway. As stream temperatures increase, nutrients such as phosphorous are released from sediment in greater quantities. These nutrient loads cause algae blooms and reduce oxygen levels that are critical for aquatic organisms.

Impervious surfaces not only increase the volume and temperature of stormwater, they also shorten the amount of time it takes the water to enter a stream, which leads to increased peak flows. A peak flow or discharge is defined as the maximum rate of stormwater runoff that occurs during a specific storm event. Increased peak flows from impervious surfaces cause water to move quickly to and through a stream, which can lead to flooding, streambank erosion, stream widening, sediment deposition, loss of fish habitat, and decline in water quality. In Pennsylvania, for example, there are over 4,127 miles of streams that are impaired and damaged by stormwater runoff.

It's also important to consider the costs of building and maintaining stormwater piping and detention systems. The city of Philadelphia estimates that the annual cost of collecting stormwater and performing maintenance for stormwater services exceeds $100 million. Municipalities large and small face increased permitting requirements and financial penalties from both Federal and State governments. These requirements are in place to reduce peak flows and TDMLs as well as repair inadequate stormwater and sewer systems.

Many municipalities have been classified by State and Federal Departments of Environmental Protection as MS4s or Municipal Separate Storm Sewer Systems communities. Under the U.S. Environmental Protection Agency's National Pollution Discharge Elimination Program (NPDEP), these communities are required to obtain an NPDEP Phase I or II Permit based on population, the size of their MS4 systems, industrial uses, and number and size of new construction sites. The objective of these permits is to use municipal stormwater management plans and programs to reduce the discharge of untreated, polluted stormwater into streams and other waterways.

Forests and Trees Reduce Stormwater

Whether they are preserved during development or newly planted afterwards, trees, forests, and other green infrastructure reduce the volume and speed of stormwater entering waterways. They also remove pollutants that would otherwise wind up in our waterways. Planting and preserving landscapes to reduce peak flows and meet TMDLs is a basic concept behind stormwater management today. Forests and trees—even trees around sidewalks and parking lots—filter, slow, and reduce the flow of stormwater because their root systems and leafy canopy capture rainfall. This allows water to be removed from a landscape through both transpiration and evaporation. Transpiration is the movement of water in a plant from the roots up and out through the leaves into the air. Evaporation removes some of the water held on leaf, branch, and stem surfaces. Together, transpiration and evaporation are called evapotranspiration.

Planting and preserving landscapes to reduce peak stormwater flows is a basic concept behind stormwater management today.

The ability of trees and other green infrastructure to intercept and remove stormwater has been well studied. A single mature oak can transpire over 40,000 gallons of water annually. Average interception and evaporation of annual rainfall by a forest canopy ranges from 10 to 40 percent depending on the type of trees and leaves, time of year, and amount of rain in a storm event.

In northern deciduous forests, about 60 percent of annual rainfall is intercepted, or removed, through evapotranspiration. If the forest is removed, evapotranspiration drops to about 35 percent. In urban and suburban landscapes, a single deciduous tree can intercept from 500 to 760 gallons of rainwater per year; a mature evergreen can intercept more than 4,000 gallons annually. Even young, small trees help. In a recent Forest Service study, a single small tree, only 9 years old, was able to intercept 58 gallons of stormwater from a ½-inch rain event, or 67 percent of the rain that fell on its canopy.

In urban and suburban landscapes, a single deciduous tree can intercept between 500 and 760 gallons of rainwater each year.

By reducing and slowing the fall of rainwater to the forest floor, tree canopies increase rainwater infiltration. Infiltration is the percolation of water into the soil. Infiltration helps remove pollutants, cool runoff, and lower the volume and speed of stormwater that flows into stream channels. If the forest floor is properly protected from soil compaction, vegetative removal, and other injury, it acts like an enormous sponge, allowing large amounts of rainwater to infiltrate before gradually releasing water to natural subsurface channels and recharging ground water.

"Forests are the most beneficial land use for protecting water quality, due to their ability to capture, filter, and retain water, as well as remove air pollution from the air. Forests are also essential to the provision of clean drinking water to over 10 million residents of the watershed and provide valuable ecological services and economic benefits including carbon sequestration, flood control, wildlife habitat, and forest products."

—Chesapeake Bay Executive Council in 2006

Increasing Canopy Coverage for Stormwater Management

Canopy coverage is the percentage of ground surface covered by tree canopy. Increasing canopy coverage is a green infrastructure goal in stormwater management. In new developments, preserve onsite trees and woodlots, and properly select and plant street, parking lot, and other trees. In older, existing communities, increase tree canopy cover along streets, in yards and vacant lots, and in parking lots. Where growing space permits, plant large canopy trees that provide the most benefit—eight times that of small maturing trees. A U.S. Forest Service study in Oakland, CA, is monitoring 1,800 newly planted trees for 40 years to determine if their canopy can reduce the volume of contaminated stormwater entering the San Francisco Bay by 9 million gallons each year. New York City's street trees intercept rain, reducing stormwater runoff by **890.6 million gallons annually**, with an estimated value of $35.6 million. Citywide, the average tree intercepts 1,432 gallons of stormwater each year.

Stormwater Management Guidelines

Manage stormwater to protect water quality and treat it as an important resource. Understand, preserve, and use natural features and processes to address stormwater during the planning phase of site development. Manage stormwater as close to the source as possible. Protect and restore the infiltration capacity of surface areas. Disconnect, decentralize, and distribute stormwater discharges to reduce and slow runoff.

New BMPs for Stormwater Management

Until recently, stormwater management strategies focused on using the grey infrastructure of pipes and detention basins to move large volumes of water quickly offsite. These types of strategies do little to reduce water volume, speed, or pollution levels. Today, many States and the Federal government advocate for and require the use of nonstructural and structural stormwater best management practices, or BMPs. These BMPs promote combining nonstructural practices, such as clustered development density and riparian area preservation, with structural elements, such as retention areas, bioswales, rain gardens, and infiltration basins, to manage stormwater onsite. They also support using high-quality engineering and hydrologic information such as soil permeability tests when applying for a subdivision or other development permit.

Nonstructural BMPs revolve around Low Impact Development (LID), which includes concepts found in Smart Growth and the design philosophies of Ian McHarg's *Design With Nature* and Randall Arendt's *Conservation Subdivision Design*. LID is a land planning and engineering design approach that emphasizes understanding how onsite trees, wetlands, and other natural features can retain, infiltrate, filter, and evaporate stormwater.

Nonstructural BMPs encourage the use of existing forests, trees, and vegetation; riparian areas; wetlands; and the natural contour of the land in development. These BMPs are fully integrated into conservation subdivision design principles that promote activities such as clustering development density to minimize site disturbance; minimizing vegetation removal, grading, and soil compaction; and reducing the size and number of impervious surfaces such as streets and parking lots.

Research at Villanova University highlights the importance of structural BMPs. Structural BMPs promote infiltration and evaporation of stormwater onsite through the use of retention basins, bioretention areas, rain gardens, "Green Streets" infiltration planters,

and bioswales that use green infrastructure to actively absorb stormwater and remove pollutants. Bioretention is the use of pollutant-tolerant vegetation in retention areas to increase infiltration and evapotranspiration, and remove pollutants and sediment. Trees and vegetation can also be incorporated into detention basin retrofits to promote management of stormwater onsite. Other structural practices include green roofs, rain barrels or cisterns, wetlands, riparian buffers, and floodplain restoration.

This bioswale increases infiltration and evaporation of stormwater. (Photo: Chris Kitchen Photography)

Phytoremediation: Removal of Pollution by Plants

Many plants, especially woody plants, are very good at removing nutrients (nitrates and phosphates) and contaminants (metals, pesticides, solvents, oils, and hydrocarbons) from both soil and water. These pollutants are either used for growth and other biological functions, or are stored in wood. In one study, a single roadside maple removed 60mg of cadmium, 140mg of chromium, 820mg of nickel, and 5,200mg of lead in a single growing season. Studies in Maryland showed reductions of up to 88 percent of nitrate and 76 percent of phosphorus after agricultural runoff passed through a streamside forest buffer. Over 100 million tons of chemical fertilizer and 80 million tons of synthetic pesticides are applied to lawns each year in the United States. It is important to consider the role of trees and vegetation in removing excess fertilizers and pesticides. Excess nutrients from lawns and agricultural fields are one of largest sources of nonpoint source pollutants impacting water quality in our streams, rivers, lakes, and the Chesapeake Bay.

Stormwater Ordinances

Although the States of Minnesota, New Jersey, and Wisconsin have enacted statewide ordinances regulating the application of nonagricultural fertilizers in an effort to control phosphorus and other nonpoint pollution, stormwater BMPs are most often incorporated into municipal zoning, subdivision and land development ordinances, or both. These ordinances are comprehensive and mandate the use of both nonstructural and structural systems in subdivisions and other development to increase onsite retention, infiltration, and evaporation rather than just detention. These ordinances emphasize managing 2-year, 24-hour rain events so that post-development peak flow volumes are equal to pre-development peak flow volumes in associated stream channels.

Many ordinances mandate designing for and managing stormwater on new and redevelopment projects where 5,000 or more square feet of impervious surfaces are being constructed. These ordinances typically include development application, design, and construction requirements. Examples of common ordinance requirements include determining and reporting on overall hydrologic site conditions such as soil permeability tests, depth to bedrock, and pre- and post-development stormwater runoff computations; assessing and mapping natural resources on the development parcel including steep slopes, riparian areas, and hydric soils; and providing an overall stormwater management plan or design for the project. These plans often require designers to provide detailed drawings and specifications of all stormwater BMPs whether they are large, such as retention basins, or small, such as rain gardens.

Stormwater ordinances typically mandate the use of Low Impact Development design and construction techniques. Examples of these techniques include clustering development density on no more than 50 percent of the developable parcel; preserving sink holes, trees, woodlots, and riparian areas; avoiding development on slopes over 15 percent; and site grading that is engineered to decrease the travel time of runoff and direct runoff to pervious areas. Stormwater ordinances also limit the size of sidewalks, driveways, and streets, and mandate the use of porous paving, swales, rolled curbs, and trees and other landscaping besides turf.

Managing Stormwater: Parking Lots and Riparian Forest Buffers

Parking lots, among the fastest growing land uses, are a major cause of stormwater and stream degradation. Nonpoint source pollutants such as petroleum hydrocarbons, nitrates, and heavy metals (cadmium, copper, lead, and zinc) from brakes and rusting automobiles all wash into our streams and rivers. Even a small storm of less than half an inch will wash these pollutants into streams. The runoff from 1 acre of paved parking generates the same amount of annual runoff as 36 acres of forest, 20 acres of grassland, or a 10-acre subdivision with ½-acre lots. One inch of rainfall on an acre of parking produces 27,000 gallons of stormwater. Planting large trees in and around parking lots, especially in bioretention areas where stormwater is allowed to infiltrate into the soil, reduces the costs of managing stormwater. This positive impact can be further increased by using structural soils made from fractured gravel mixed with a clay loam soil when designing parking lot and other in-ground tree planters. This engineering solution can support the weight of concrete and asphalt and increase both rooting space for trees and water infiltration in tree planting areas. Research of these engineered soils at Cornell University, UC Davis, and Virginia Tech is showing deeper rooting and infiltration rates as well as substantial pollution removal rates.

The runoff from 1 acre of paved parking generates the same amount of annual runoff as 36 acres of forest.

Parking lots, among the fastest growing land uses, are a major cause of stormwater and stream degradation.

Research at the Stroud Water Research Center, Center for Watershed Protection, and elsewhere has illustrated that stream health is dependent on streambanks having a riparian buffer of woody vegetation. Riparian forest buffers filter sediment and remove nitrogen and phosphorous that leaches from adjacent land uses. Woody root systems provide streambank stability and shade, modify stream temperatures critical for habitat, and reduce stream velocity and downstream flooding. Preserving riparian buffers that extend at least 50 feet from the top of the bank along waterways in developed areas helps minimize stormwater that directly enters waterways and protects stream health.

Riparian buffers are often protected in development through municipal zoning ordinances, but some States like Pennsylvania are moving to protect special, high-quality designation steams by State law rather than individual municipal ordinance. Retrofitting retention basins, parking lots, and other structures as well as planting new buffers as a part of stormwater management has become a common practice in most States over the last 10 years. In many cases, this approach has proven to be more cost effective compared to constructing new retention basins and other structures. The Baltimore Ecosystem Study reported that the average cost of six inner city urban retrofits to increase stormwater infiltration and decrease surface flow was $137,000. The study also reported that stream restoration was $15,000 per acre, while forest buffers could cost less the $1,200 per acre.

Retrofitting retention basins, parking lots, and other structures, combined with planting new buffers to manage stormwater, has become a common practice in most States over the last 10 years.

Case Study — Philadelphia Stormwater Management: Green City, Clean Waters

Green City, Clean Waters

Like many cities, Philadelphia has maintenance, operational, and environmental costs associated with its combined MS4 sewer system and NPDES permits. The city spends about $125 million a year on stormwater operations and maintenance. The environmental costs of combined sewer overflows, stream degradation, and flooding are large, but difficult to estimate.

For many years, the city charged an average stormwater fee for residential water users, while nonresidential water users were charged a fee based on the size of their water meter. The revenue raised from these fees was used to fund investments in pipes and treatment plant expansions as well as operations and maintenance. In 2011, the city enacted its *Green City, Clean Waters* program, which calls for a $2 billion investment over the next 25 years in trees, green streets, and other green infrastructure. Goals of the program are to convert vacant lots to open space, enact standards for stormwater management in redevelopment, restore streams to support healthy aquatic communities, and preserve open space to manage stormwater at the source. The program seeks to disconnect 10,000 acres of properties from the city's combined sewer system. It is estimated that these actions would ultimately reduce pollution that results from combined sewer overflows by about 85 percent and save the city about $10 billion in stormwater costs.

To support this new plan and the traditional costs of infrastructure investment and maintenance, the city recently reallocated its stormwater fees for nonresidential properties to reflect both the parcel size and the amount of impervious surface on the parcel. Philadelphia's 80,000 to 90,000 nonresidential property owners now pay stormwater fees per 500 square feet of parcel and per 500 square feet of impervious surface located on the parcel. In 2012, residential property owners paid an average of about $13.00 a month for stormwater. To accompany the city's parcel-based billing, stormwater credits are offered if a customer has or installs pervious paving, bioretention basins, trees, or other stormwater features on his or her property that manage the first 1 inch of runoff. This is not a tax credit, but a discount directly on the stormwater charge. This fee structures generates about $125 million in municipal revenue a year.

For more information about the Philadelphia Green City, Clean Waters Plan, visit the Web site: http://phillywatersheds.org/what_were_doing/documents_and_data/cso_long_term_control_plan.

Relevant Factsheets

A1 – *Using Smart Growth Principles to Plan Sustainable Communities* – Discusses approaches that can be used to manage growth in concert with conservation, ecology, and quality of life values.

N3 – *Regulatory Approaches to Protecting Natural Resources* – Many of these regulatory tools are important in stormwater management (e.g., steep slope, riparian area, impervious surface ordinances).

N6 – *Planning Tools to Protect Water Quality* – Many of these tools can also be used to help manage stormwater.

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P rinciples, people, and policies
L and planning and pressures
A pproaches
N atural resource planning tools

A4: Using Science to Substantiate Natural Resource Planning

Science-based information helps validate the protection of natural resources during planning.

Overview

Communities are looking for scientific research to provide direction and support for the decisions they are making about protecting natural resources when planning. This factsheet explains how science plays a role in validating the protection of natural resources during the planning process. Discussion centers on tools that natural resource professionals should be aware of and the importance of knowing when, where, and how to provide science-based information.

How to Integrate Science into the Planning Process

A key to sustainable management of natural resources is the ability to use science to better understand natural systems and develop applications and strategies that can be used to better protect natural resources. Successfully integrating the knowledge gained by science into the planning process requires a thorough understanding of the scientific evidence and a way to share it with those who are making planning decisions.

Integrating science into planning is critical, according to Haller and Gerrie (2007): "If we do not base our public policy decisions, at least in part, on objective science, then it is feared that our decisions will be open to the whims of political fashion."

Science can be categorized as pure or mandated. Pure science represents an open-ended process that arrives at empirical truths and scientific consensus. Pure science generally appeals to reason and truth and is free from political bias. Mandated science, on the other hand, is constrained by shorter time frames, and it must provide definitive statements on issues relevant to decisionmakers. The planning process uses mandated science, which requires scientists to provide expert scientific testimony in a way that is acceptable to the scientific community and to policymakers.

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Scientific research, like planning, can be conducted at a variety of scales from landscapes to ecosystems. The level of information collected and imparted to the planning process should correspond to the level and scale of planning. If science is to be successful in making policy, it must have relevance to solving human problems and consider social values.

> Science should be viewed as a knowledgeable participant whose role in the planning process is to inform, not make decisions.

Role of Science in Planning

Science is an ongoing process of discovery. It should be viewed as knowledge gained through observation and experiment that can be integrated into the planning process to successfully craft policies. Science is an empirical process whereas planning is an ethical and political process. Therefore, the role of science should be one of collaboration in which science is a well-informed stakeholder or participant that provides information about options, costs, and benefits that can be evaluated to guide social action. The key to successfully integrating science into the planning process is to keep science in the loop and use it to inform, not make decisions.

> "It will always be a human problem to judge the adequacy of scientific knowledge and to factor that knowledge into decisionmaking."
>
> —Ehrlich and Daily (1993)

How much someone understands stewardship and natural resource protection differs based on his or her knowledge of and exposure to the decisionmaking environment and often the role that individual has in this process:

Decision/Policymaker: Planners and elected officials must make decisions that benefit the greater good of the community. They must be able to take in and evaluate a variety of information and social values to understand the potential impacts of their decisions and policies.

Developer: To the developer, resource protection and stewardship are generally not priorities unless they provide minimal cost and maximum economic benefit.

Urban/Rural: The perceptions and understanding of stewardship and resource protection can be vastly different between urban and rural residents. This usually relates to familiarity with and access to the environment. People living in rural areas tend to be more likely to exhibit a stewardship or land ethic than a person who has grown up in a city.

Homeowner/Citizen/Descendants: When large tracts of land are passed down, those inheriting the land can be faced with the decision of either protecting the land or subdividing and selling it. When zoning places a highest and best use value on properties, which puts agriculture and open space at the bottom and development at the top, protecting resources may not be an economically feasible option.

Family members who inherit large tracts of land may have to decide between protecting the land or subdividing and selling it. (Photo: Robert Fitzhenry, U.S. Forest Service)

Scientific Tools to Assist in Planning

There are a number of tools that promote scientific inquiry and research. This section highlights some of the more commonly used tools and their applicability to planning.

Computer Models and Geographic Information System (GIS)-based Tools

In this age of increasing technological innovations, computers, software, and mapping technologies are greatly enhancing the ability of resource professionals to efficiently collect and manage data that can then be used to create plans and monitor projects.

ArcGIS/ArcInfo

When purposefully applied GIS modeling is integrated into the design and planning process, it can help users understand the structure and function of natural systems and guide decisionmaking.

- Spatial Analyst – This ArcGIS extension provides powerful tools for comprehensive, raster-based spatial modeling and analysis.
- 3D Analyst – This ArcGIS extension creates a 3D GIS environment for viewing, managing, and sharing geospatial data.
- ArcHydro – This geodatabase tool supports water resource applications in ArcGIS.

> "Form must follow more than just function; it must also respect the natural environment in which it is placed."
>
> —Ian McHarg, Design with Nature (1967)

i-Tree

i-Tree is a suite of software tools developed by the U.S. Forest Service that is driven by validated, peer-reviewed science and modeling. These easy-to-use freeware programs allow users to assess the structure, function, and value of urban tree populations for advocacy, management, and planning. i-Tree uses local data to statistically assess urban forest composition, benefits, and value that the urban forest provides.

- i-Tree ECO (adaptation of the Urban Forest Effects model) – Provides a broad picture of the whole urban forest; quantifies urban forest structure, environmental effects, and value to communities.
- i-Tree Streets – Focuses on benefits provided by street trees; places a monetary value on the environmental and aesthetic benefits that street trees provide each year.
- i-Tree Hydro – Simulates the effects of changes in tree and impervious cover on streamflow and water quality within a watershed.

WinSLAMM

This Windows-based simulation program models the stormwater impacts of new or existing development and the benefits of various control measures. The model has been used for over 15 years to calculate urban stormwater runoff volume and pollution loads, and to asses a wide range of management measures. The model enables accurate analysis at the planning and design levels.

Habitat Suitability Index

This tool evaluates the impacts of changes in water or land use on fish and wildlife habitat. It estimates the ability of an area to meet an animal specie's requirement for food and cover.

Air Quality Index (AQI)

This EPA tool reports daily air quality. The AQI focuses on the health effects related to air pollution.

Condition Index

This EPA tool evaluates a region's environmental condition by watershed. Resource managers can use the resulting condition map to identify areas vulnerable to resource loss.

Riparian Buffer Mapper

This tool for large-scale projects or community plans uses high-resolution imagery to monitor the extent of riparian forest buffers.

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
When the AQI is in this range:	*..air quality conditions are:*	*...as symbolized by this color:*
0-50	Good	Green
51-100	Moderate	Yellow
101-150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

EPA's Air Quality Index is divided into six categories. (Graphic: http://www.epa.gov)

Resource Assessments

Resource assessments provide foundational information for developing plans at all scales, both public and private. Assessments can be made at a broad resource/watershed level or may be more focused and resource specific.

Natural Resources

- **Existing Resource and Site Analysis** – Provides mapping and written descriptions that identify all existing natural resources on a site. Site analysis is an important first step in the submission of applications for subdivision and land development projects.
- **Natural Resources Conservation Service Rapid Watershed Assessment** – Provides initial estimates of where conservation investments would best address concerns of stakeholders within a watershed.

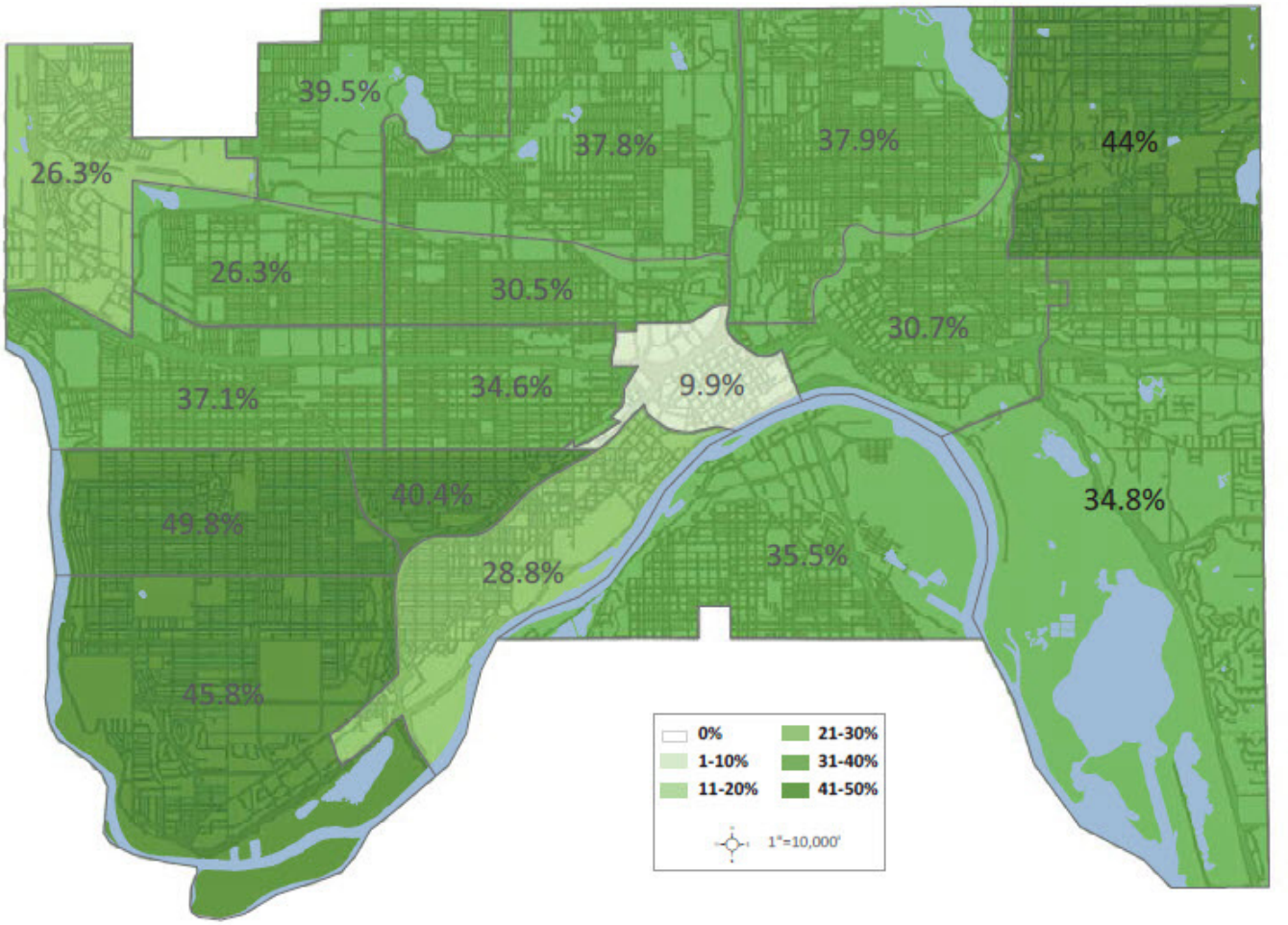
Assessing existing natural resources on a site provides essential information for planning.

Water Resources

- **Stream Visual Assessment Protocols** – U.S. Department of Agriculture assessment protocol evaluates the condition of aquatic ecosystems associated with streams.
- **Wetland Identification, Delineation, and Assessment** – U.S. Army Corps of Engineers 1987 Wetland Delineation Manual and Regionals Supplements that identify, delineate, and assess the condition of wetland and water resources.

Urban Tree Canopy Assessments

These assessments increase decisionmakers' understanding of their urban forest resources, particularly tree canopy and the beneficial ecosystem services trees provide to a community (pollution mitigation, carbon sequestration, and stormwater mitigation, among others). Assessments provide key information related to the extent of the urban forest to resource managers so they can begin to set goals and plan.



Urban tree canopy assessments provide information for setting goals and planning. (Map: http://www.stpaul.gov)

Wildlife Resources

Many States use assessment protocols to evaluate the condition and value of natural communities for wildlife. Assessments may be at the community or species-specific level.

America's Byways®

This program was previously called the Scenic Byways Program. The factors that determine scenic byway designation are referred to as intrinsic qualities—attributes or features that are considered to be representative, unique, irreplaceable, or distinctly characteristic of an area. These qualities are categorized as archeological, cultural, historical, natural, recreational, and scenic.

AMERICA'S BYWAYS

(Logo: http://commons.wikimedia.org)

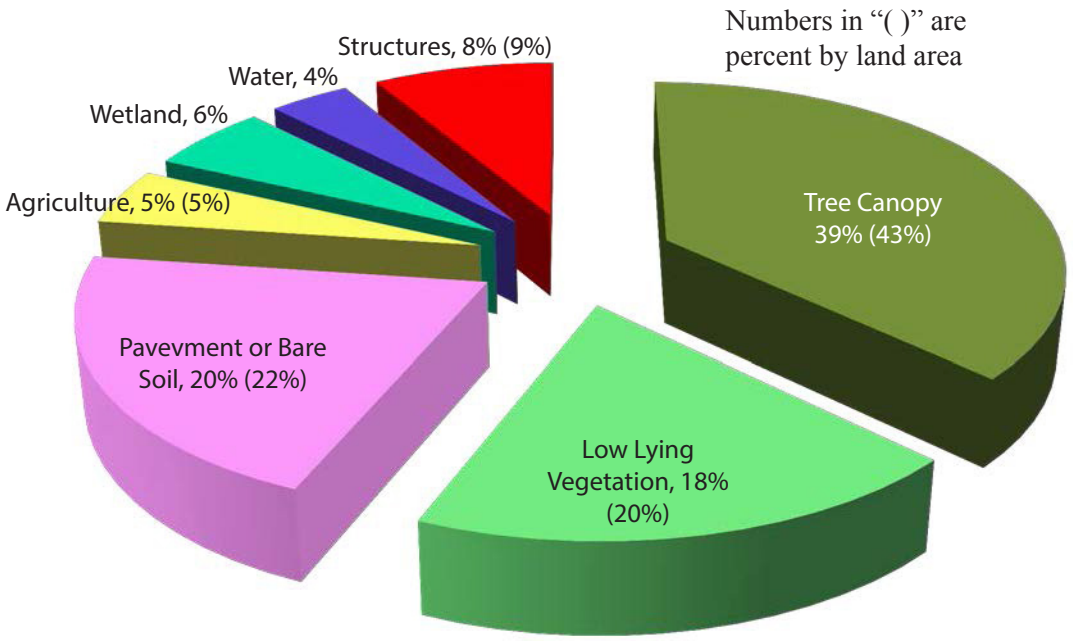
Historical and Cultural Resource Assessments

These can be used to preserve natural resources that are directly linked to the historic and/or cultural resources within a site. The U.S. Department of the Interior provides numerous guidance documents to help conduct these types of assessments.

Case Study — Mapping Tree Canopy for Long-term Urban Forestry Planning

Connecticut, Massachusetts, Rhode Island, Vermont, and the District of Columbia conducted urban tree canopy (UTC) assessments and site-selection analysis in two communities in each State and in Washington, DC. The information gained from these assessments has led to numerous positive outcomes that include the establishment of UTC goals and increased funding for urban forestry programs. The UTC assessments are actively used by communities, cities, academic institutions, private industry, nongovernmental organizations, and State government. Advances in UTC assessment protocols will give communities access to more relevant information about their urban forests.

For more information about assessing urban tree canopy, visit the Web site: http://nrs.fs.fed.us/urban/utc.

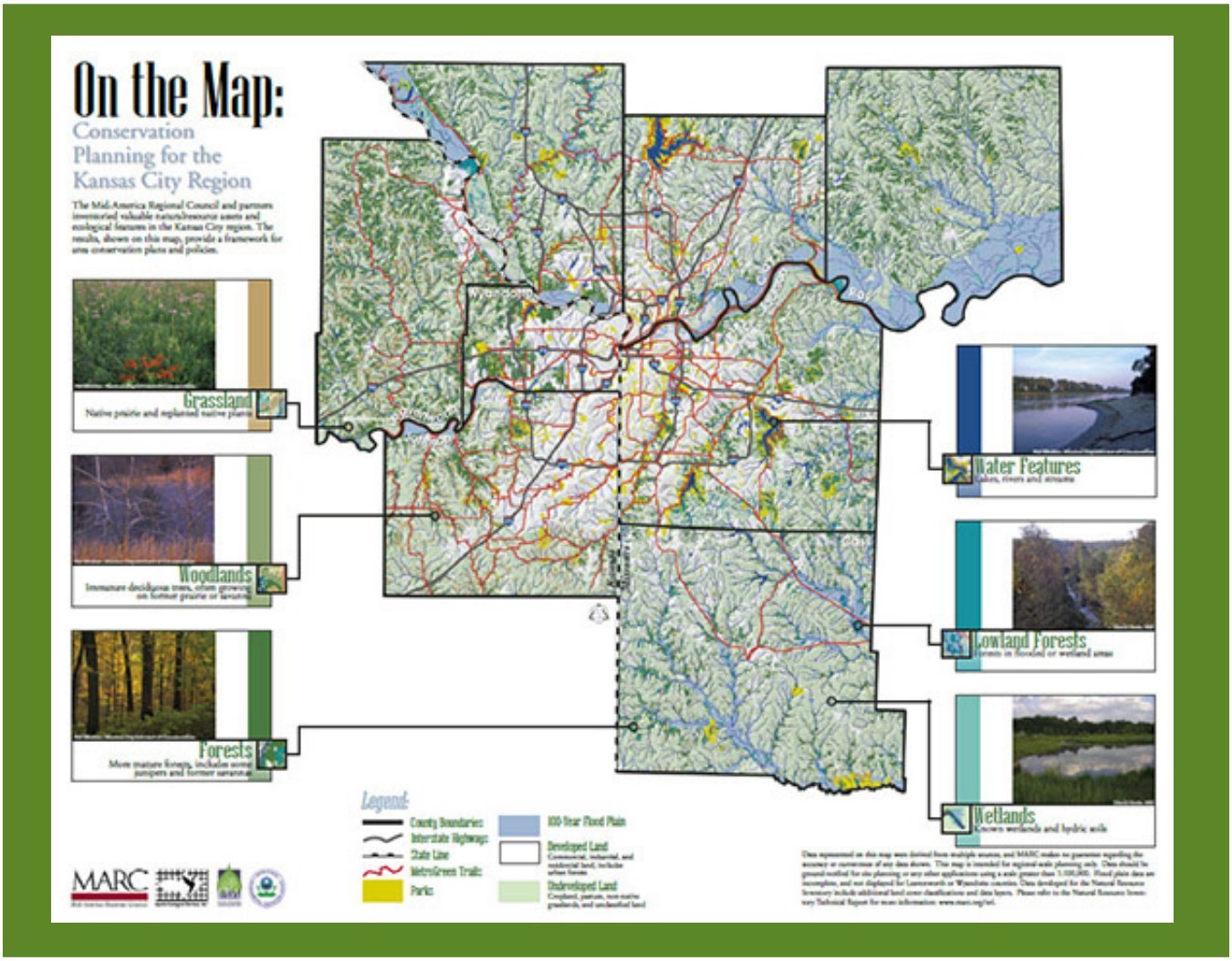

Numbers in "( )" are percent by land area
Structures, 8% (9%)
Water, 4%
Wetland, 6%
Agriculture, 5% (5%)
Pavevment or Bare Soil, 20% (22%)
Tree Canopy 39% (43%)
Low Lying Vegetation, 18% (20%)

A pie chart summarizes land cover, including tree canopy, in the city of Burlington, VT. Numbers in "( )" represent the percentage based on the city's land area (water and wetland excluded). (Pie chart: http://www.fs.fed.us/nrs/utc/reports/UTC_Report_Burlington.pdf)

Case Study — Mid-America Regional Council Natural Resource Inventory

In 2003, the Mid-America Regional Council began developing an inventory of digital map data that show valuable natural resource assets and ecological features in the Kansas City region. Kansas City's natural resources, from forests and glades to prairies, wetlands, and stream corridors, and threatened by intense development pressure. The natural resource inventory map provides a framework for environmental planning at local and regional levels to help local communities proactively conserve or restore natural resources during development. This effort is also expected to help create high-quality livable environments through coordinated conservation and economic development.

For more information about urban tree canopy assessment, visit the Web site: http://nrs.fs.fed.us/urban/utc.



The Mid-America Regional Council and partners developed this natural resource inventory map for the Kansas City region. (Map: http://www.marc.org/Environment/Natural-Resources/pdf/NRI-one/nrimap.aspx)

Relevant Factsheets

P3 – *The Role of the Natural Resource Professional in Planning* – Emphasizes how natural resource professionals can use science during the planning process to validate protecting natural resources.

P5 – *Principles of Ecosystem Services* – Provides an understanding of ecosystems and the services they provide.

L2 – *Scales of Planning: From Landscapes to Ecosystems* – Helps resource professionals understand options for integrating science-based information into different levels of planning.

L4 – *The Power of Collaboration in Community Planning* – Ties into the role of the resource professional in integrating scientific information into planning at various levels and helps them understand how to communicate this information to a broader audience.

N1 – *Developing a Natural Resource Assessment* – Directs resource professionals to natural resource assessment tools that can provide communities with essential resource information before the planning process.

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L and planning and pressures
A pproaches
N atural resource planning tools

N1: Developing a Natural Resource Assessment

Assessing natural resources is an important step in making environmentally sound development decisions. (Photo: http://www.usda.gov)

Overview

This factsheet describes a natural resource assessment, reviews its components, and discusses its importance in making environmentally sound development decisions.

Assessing Natural Resources in the Land Use Planning Process

Identifying the location, quality, and availability of natural resources is a fundamental first step in sound land use planning. Natural resource inventories can be completed at watershed, regional, local, or even at site scales. At a watershed or regional scale, natural resource assessments provide the information needed to make decisions related to managing forests; assessing water quality; acquiring open space; and managing stormwater, wildfire, and invasive species.

Larger scale natural resource assessments serve as a logical basis for substantiating decisions made during development of comprehensive plans and zoning ordinances. At a local level, municipal ordinances require natural resource inventories on parcels proposed for subdivision as part of the permit application. Information from these inventories is used to locate streets, utilities, and community amenities while protecting ecologically sensitive areas during the development process. Natural resource inventories have been used extensively for making sound, scientifically validated arguments for using cluster density and other low-impact development approaches.

In his 1969 book *Design with Nature*, Ian McHarg describes how various types of information provided by a natural resource inventory can be graphically overlaid in a composite map that identifies the best places to locate development while best protecting natural features and function during the land development process. Today, ArcGIS is commonly used to create spatially explicit geodatabases and other graphic analysis overlays that help planners better understand how nature can be protected and celebrated in the design process. This methodology is used to quickly identify sites where development should not occur. Steep slopes, wetlands, hydric soils, riparian areas, and other conservation areas are quickly factored out of the design solution.

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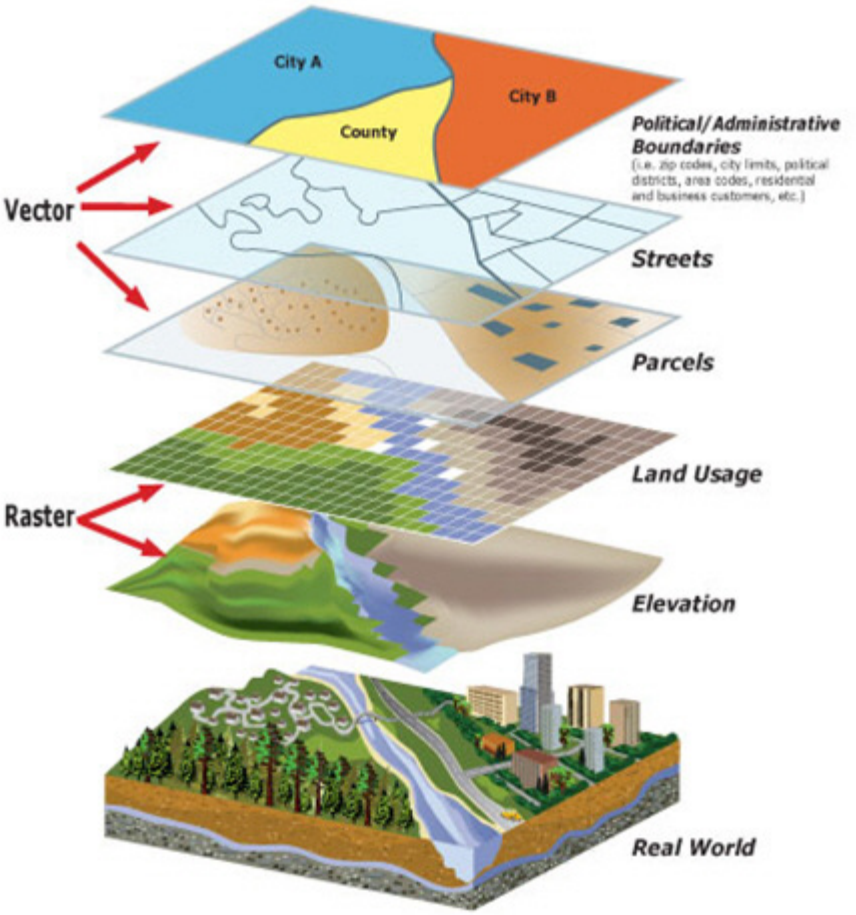
GIS analysis makes it possible to easily consider the location and importance of woodlots, sensitive environmental areas, views, and other secondary conservation areas. Planners and engineers can then use the new parcel map to begin the planning process using only the most suitable land—ensuring more environmentally sound design.

In established parks and open space, natural resource inventories and composite maps that identify important natural resources and features are invaluable components of a suitability analysis. When a suitability analysis is coupled with value ratings, this is referred to as a rubric analysis. A rubric analysis is used to evaluate the condition of vegetation, wildlife habitat, soils, streams, and other natural features. The conditional rating of those resources can help planners prioritize restoration and conservation objectives during the planning phase of a development project.



Geographic information systems use overlapping digital map layers to help users analyze data about important natural resources. (Map: Birmingham, AL, National Weather Service GIS Data Page)

Some Natural Resource Assessment Methods

- **Ohio Rapid Assessment Method** uses six metrics to assess wetlands: size, upland buffers and surrounding land use, hydrology, habitat alteration and development, special wetlands, and plant communities.
- **Penn State Cooperative Wetlands Center Rapid Wetland Condition Assessment** evaluates and scores a number of stressors, including buffer width, sedimentation, dissolved oxygen, vegetative and hydrologic alteration, and contamination.
- **USDA National Water and Climate Center Stream Visual Assessment Protocol** assesses the condition of aquatic systems by evaluating and scoring a number of significant factors, including riparian zone, aquatic habitat, and nutrient enrichment.
- **USDA Forest Service Forest Health Monitoring and Urban Forest Effects Model** determines the status, changes, and trends in urban forest condition. It also quantifies forest function (e.g., carbon storage and sequestration, stormwater management) by analyzing information on tree species, tree health, and tree size collected in random measurement plots and aerial surveys.

Content of a Natural Resource Inventory

Regardless of scale, most natural resource inventories have similar content; however, they can vary depending on the scale and degree of detail needed. Natural features, natural processes, historic landmarks, landscape features, and rare and threatened species are commonly inventoried in natural resource assessments. More indepth natural resource inventories often document community value and local issues related to each. This information can be extremely important in engaging stakeholders and for building consensus for planning decisions.

The following overview discusses important components of a natural resource inventory and how their protection is considered in the local planning process.

Watersheds

A watershed is the area of land that drains to a river or other body of water. Watersheds can range widely in size as well as the land uses and landscapes they contain. A watershed perspective helps planners manage the cumulative impacts of development in both space and time. Aerial views of watersheds can help planners assess how development might affect stormwater, nonpoint water pollution, wildlife movement, recreation, and fire management.

A watershed perspective helps planners manage the cumulative impacts of development.

Existing Land Cover

Satellite imagery and aerial photography are used to view land cover and land use at varying resolutions and scales. At larger scales, they can help determine existing land uses and the linkages between them that may exist. Satellite imagery is useful in providing a spatial view of the impact of new development when it is overlaid with existing land use. Satellite imagery is also often used to identify the locations of natural areas, rare habitat, historic land use, or ecological function necessary in making conservation decisions. Land cover is used to develop land use maps that provide data for the development of zoning maps and land use ordinances.

Floodplains

Floodplains are landscapes near rivers and streams that are prone to flooding. They are important for agricultural use, providing plant and wildlife habitat, and enabling water infiltration that replenishes water tables. Floodplains are officially defined by the reoccurrence of periodic flooding from a storm intensity type. For instance, a 100-year storm has a 1 in 100 chance of occurring in any given year. The Federal Emergency Management Agency is responsible for mapping and modeling flood-prone areas. Ordinances that address development should be crafted with storm intensity in mind. Standards should be developed that reflect the intensity of storm events, build on floodplain delineations, and prevent and buffer development in sensitive floodplain.

It is important to inventory water resources.

Rivers, Streams, and Riparian Areas

Inventorying water resources has become more important with recent Federal and State regulations mandating the management of stormwater and nonpoint sources of pollution. Water flow and quality provide critical data for regulating proposed development. Stormwater management plans address the volume of stormwater runoff in new development and redevelopment, especially when expected runoff impacts rivers and streams designated as being impaired.

Water flow and quality provide critical data for regulating proposed development.

Watercourses can be classified as perennial (permanently flowing), ephemeral (flowing only shortly after rain), or intermittent (flowing during seasonal wet periods). Watercourse inventories should include location; pollution and water quality data; and processes that further impact water quality such as erosion, scouring, invasive plants, and even trash. Riparian areas are low areas adjacent to rivers and streams. An inventory should map the width of the riparian area setback or "buffer" and assess the quality of its soils and vegetation. The width of riparian buffers can range from 50 to 300 feet on either side of the stream, but should never be less than 40 feet.

Wetlands

Wetlands are areas inundated by surface or groundwater in an amount sufficient to support plants that are adapted to the level of saturation of the existing soil. Wetlands can also be found on slopes and other steep areas with springs. In most States, wetlands are regulated by the U.S. Army Corps of Engineers, the State's environmental protection department, or both.

Wetlands are one important component of a natural resource inventory.

The U.S. Fish and Wildlife Service and Army Corps of Engineers classify wetland types by three characteristics: vegetation, hydrology, and soils. Wetland soils are characterized by the presence of organic or peat soils. Although many agencies and departments provide maps that identify soils and water levels, they should not be relied upon for delineating wetlands. Field surveys are required to delineate wetlands. Surveys should be used to document wetland boundaries in natural resource inventories being used for local and site-level planning and the development of wetland ordinances. A general wetland protection ordinance requires a minimum buffer of 50 feet around wetlands, although wider buffers are preferred.

Hydric Soils

Hydric soils are formed by long-term water saturation. Characteristics include poor drainage, ponding, low aeration, and an iron deposition layer. Hydric soils (and nonhydric soils that include seams of hydric soils) are not suitable for development because of instability issues. Natural resource inventories should include specific information about soils and delineate areas of hydric soils as identified in U.S. Geological Survey maps.

Soil Suitability for Septic System Construction

Soils that are not suitable for septic systems tend to be hydric with seasonal or permanent high water tables, have poor natural drainage, are inundated with flood waters, or have a shallow depth to bedrock that does not allow infiltration. Slopes over 12 percent are not suitable for septic systems because of erosion and downslope seepage. Septic systems on alluvial, sandy, or well-drained soils near streams can contaminate ground and surface water. Most septic system regulations require a minimum depth of 24 inches of natural soil above the seasonal high water table. Onsite testing is required to identify the suitability of soils for viable sewer systems and is mandated as part of the construction permit process in most places.

Groundwater and Wellhead Areas

Mapping and protecting the functions of groundwater recharge areas and wellheads are crucial for protecting drinking water. Groundwater is impacted by grade changes and runoff, leakage from underground storage tanks, and increases in nitrogen. Groundwater and well recharge protection needs vary greatly depending on adjacent land use, soil types, land cover, water table depth, slope, and even vegetation. A common standard for limiting disturbances in important recharge areas is to require that disturbance be at least 1,000 feet from a known well. Water recharge areas are often protected on a more regional scale in comprehensive planning or in the development of land use plans that designate the areas as protected lands.

Mapping and protecting the functions of groundwater recharge areas and wellheads are crucial for protecting drinking water.

Impervious Surfaces

Impervious surfaces are surfaces that do not allow water infiltration. They include parking lots, roofs, roads, and other built structures in the landscape. Impervious surfaces increase the volume of runoff and are a significant source of pollution. Municipalities should consider the impact of impervious surfaces and set standards that limit the amount of imperious surface in new and existing development.

Topography and Steep Slopes

For inventory and mapping purposes, slopes are often categorized as precautionary or prohibitive. Prohibitive slopes are those over 25 percent where grading and land development should be avoided. Precautionary slopes of 15–25 percent should also be avoided if possible, or at least require special engineering and site planning, such as step-down foundations and a grading plan designed by a licensed engineer.

Forest Blocks and Woodlands

Forest blocks and wooded areas should be inventoried using aerial photographs and satellite imagery. Field inventories are required for more detailed information on tree species, forest condition and structure, understory vegetation, invasive species, wildlife, wildfire fuel loads, and other factors.

Inventory forest blocks and wooded areas using aerial photographs and satellite imagery.

Wildlife Habitat and Corridors

The quality of wildlife habitat is determined by the type and distribution of desirable shelter and food, patch size, and corridor connectivity. A wildlife corridor is any linear landscape that connects two or more natural areas and provides for wildlife movement. Longer and wider

corridors are typically required to support larger animals and bird populations. Development can fragment and isolate wildlife habitat, thus impeding migration, roaming, foraging, and living. Wildlife habitat and corridors can be protected by properly siting development. Planners should first use watershed or regional data to ensure that landscape-scale linkages exist and then work with a biologist or natural resource professional to field check the site to obtain any additional information that may be relevant.

If a municipality chooses to protect sensitive habitat, it can incorporate a Wildlife Habitat Overlay District into the provisions of its comprehensive land use regulation ordinance. The purpose of the Wildlife Habitat Overlay District is to reduce the continuing loss of habitat for native species in rural districts, while simultaneously accommodating development in those districts. The intent is to minimize the removal of woody vegetation that breaks large, unfragmented blocks of forest into smaller patches of forest; it also minimizes activities that block or limit species movement between unfragmented blocks of forest. An example of a Wildlife Habitat Overlay District can be found at
http://www.beginningwithhabitat.org/pdf/Brunswick%20Wildlife%20Habitat%20Overlay%20District.pdf.

Important and Sensitive Natural Areas

Rare, threatened, and other important plants and animals may be present on land where development is planned. Field surveys and mapping are often required to document the location of important species; habitat; or other landscape characteristics such as waterfalls, bluffs, ridges, and unique geological features. Natural resource inventories should also document the presence of threats to rare, threatened, or important local species. A common threat that these inventories often address is the impact of invasive species on ecological function or successional processes.

Landowners and communities can work with the U.S. Fish and Wildlife Service to develop habitat conservation plans for endangered species, such as this California tiger salamander. (Photo: John Cleckler, U.S. Fish & Wildlife Service)

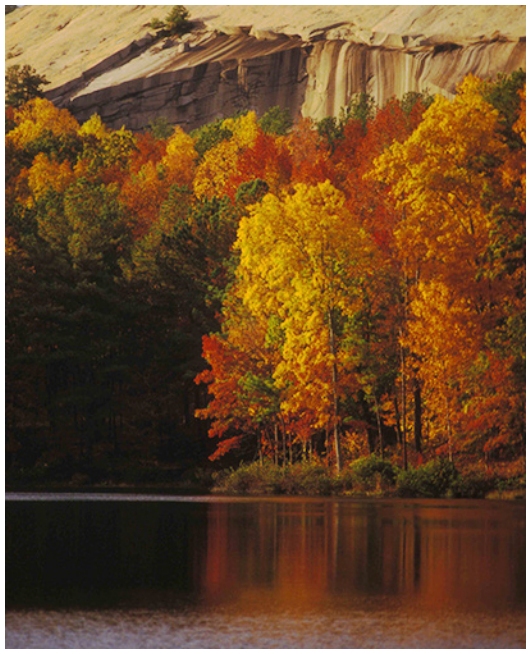
The Endangered Species Act of 1973 recognized that endangered and threatened species of wildlife and plants "are of esthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people." Habitat conservation plans under section 10(a) (1) (B) of the act provide for partnerships with non-Federal parties to conserve the ecosystems upon which listed species depend, ultimately contributing to their recovery. Private landowners can work with the U.S. Fish and Wildlife Service to develop habitat conservation plans and apply for incidental take permits that specifically describe measures to minimize and mitigate the effects of their actions to ensure that species will be conserved. To learn more, see http://www.fws.gov/endangered/esa-library/pdf/hcp.pdf.

Agriculture

Agricultural lands support businesses and families, and contribute to the character of a place. Prime farmland and soils should be inventoried and mapped as part of comprehensive and other plans. Agricultural inventories often document important historic features such as barns and schoolhouses. Agricultural lands support woodlots, steep slopes, riparian areas, and corridors that should be identified and assessed in a natural resource inventory.

Viewsheds

Desirable views of ridgelines, lakes , riparian areas, and other community icons often have symbolic meaning to local residents. Desirable views can increase the value and salability of homes. Important views can be protected by adding restrictions to zoning ordinances that limit development on ridgelines, protect special features, require the use of certain colors and building materials that blend into landscapes, and direct the placement of structures and infrastructure within visually important landscapes.



Important views can be protected by adding restrictions to zoning ordinances.

Urban and Community Forestry

It's crucial to understand the location, health, and structure of street and park trees in order to manage and protect them. Inventories of a community's tree population can be made using hand-held GPS units to enter each tree's data into a computer database. Tree inventories can provide useful data for developing tree maintenance, tree removal, and tree planting plans and budgets.

Percent canopy coverage has recently become more important when assessing the urban forest. Light detection and ranging and other aerial imaging methods are used to assess canopy cover and set goals for tree planting and canopy cover gains. Common goals for tree canopy are 40 percent in urban and high-density suburban areas, 50 percent in low-density suburban areas, 25 percent in high-density residential areas, and 15 percent in commercial areas. Tree inventories are being used to identify the composition of urban forests so that they can be diversified by species. Communities are using urban tree canopy coverage to set and meet tree-planting goals and strategically direct tree planting for economic vitality, human health, and even stormwater management in urban areas throughout the United States.

Historic and Landmark Trees

Although entire woodlots and forests can be considered historic landscapes, more often historic value is attached to single trees or small groups of trees. An inventory of historic trees should include a survey of the trunk location and basal elevation as well as tree health. Documenting the drip line (outermost edge) of the canopy during a natural resource inventory helps ensure that the trees are adequately protected when developing grading plans during the engineering phase of the design process.

Historic value can be attached to single trees in a community.

Historic and Cultural Features

A thorough natural resource inventory should also document information obtained from local historians and ethnic organizations to identify and assess the importance of cultural features such as old buildings, bridges, ruins, earthworks, burial grounds, stone walls, copses of trees, witness trees, and bluffs and geological features.

Environmental Impact Assessments

The enactment of the Federal National Environmental Protection Act in 1970 mandated the completion of environmental impact reports for any Federal project or program that could modify or harm the environment. These reports consider all elements of the environment: physical, social, and economic. Reports for dams and other large projects have been especially large in scale.

California and other States have enacted their own Environmental Protection Acts, which require environmental impact statements and reports from municipalities and counties for large subdivision and other development.

These environmental statements identify the significant impact of a development on the environment, how any such impact might be mitigated or avoided, and possible alternatives to the project. This information is then considered in decisions to approve, deny, or modify a proposed project. Some States require that these reports also consider the impacts of proposed development on air and water quality; traffic; and the increased need for schools, police and fire, and other public services. They may also require that a study and statement be prepared concerning how a proposed development adds to cumulative social, economic, and environmental impacts, both good and bad.

Case Study — Ordinance No. 363, Township of Lower Makefield, Bucks County, Pennsylvania

THE TOWNSHIP OF LOWER MAKEFIELD
BUCKS COUNTY, PENNSYLVANIA

(Web site: http://www.lmt.org)

In response to State and Federal stormwater management requirements, Lower Makefield Township in Bucks County amended its Subdivision and Land Development Ordinance in December 2006. The amendment provided for the use of Low-Impact Development (LID) alternatives for both project design and stormwater management. The township believed that LID strategies supported its comprehensive plan and met multiple objectives such as mitigating floods, reducing impervious surfaces, and protecting open space. The amendment required that development plans submitted to the township include an approved Existing Resources and Site Analysis Map (ERSAM) as well as an onsite visit to verify the submitted ERSAM Plan.

ERSAM contents include soils, slopes, floodplains, watercourses, trees and vegetative cover, wetlands, important views, commonly used trails, and other natural features. The ERSAM is used to develop a required Natural Resource Conservation Plan that describes a number of LID design objectives, including how stormwater will be captured on site, how existing contours and vegetation will be respected, how building layout will provide for advantageous solar orientation, and how open space and other resources will be conserved. The requirements of the ERSAM plan are separate from the detailed hydrological studies required for development of a stormwater management plan. To learn more, see http://www.lmt.org/departments/planning-zoning/.

Relevant Factsheets

P5 – *Principles of Ecosystem Services* – Provides a basic overview of ecosystem processes, services, and products. It discusses the impact of difficulties in estimating the monetary value of carbon sequestration and other ecosystem services. It explains how compensation for conserving ecosystem services is being considered as a viable option to provide an incentive for increased natural resource protection and management.

A1 – *Using Smart Growth Principles to Plan Sustainable Communities* – Introduces the principles and strategies of smart growth to create communities that are walkable, affordable, and offer more opportunities to manage growth in concert with conservation.

A3 – *Managing Stormwater with Green Infrastructure* – Discusses stormwater and its associated environmental and social costs while providing an overview of some of the commonly used best management practices and ordinances for stormwater management.

N2 – *Comprehensive Planning for Natural Resource Conservation* – Explains some of the tools and processes required for comprehensive planning.

N3 – *Regulatory Approaches to Protecting Natural Resources* – Discusses regulatory land planning tools that are commonly used to protect natural resources.

Resources

Arendt, R. 1994. Designing open space subdivisions: a practical step-by-step approach. Media, PA: Natural Lands Trust. 149 p.

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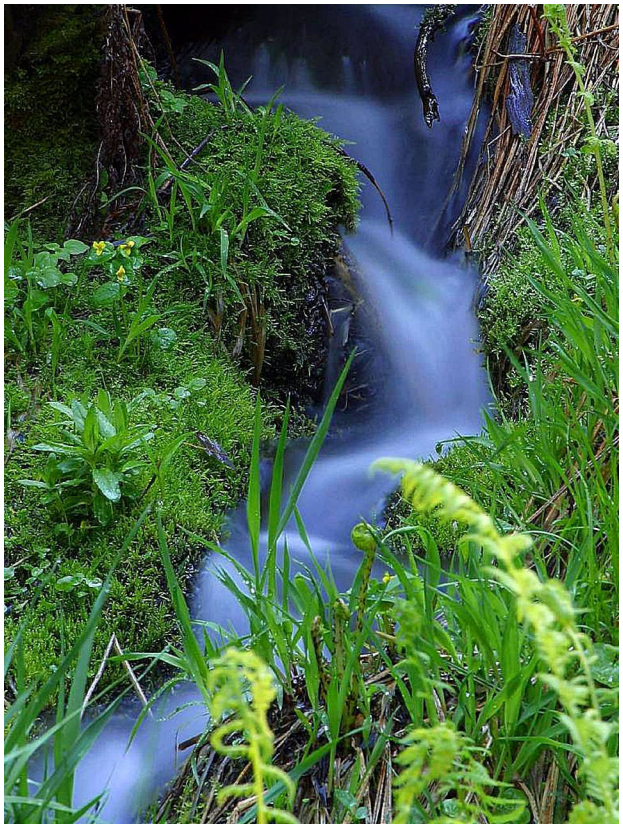
USDA
United States Department of Agriculture

Changing Landscapes

Land use planning curriculum for natural resource professionals

P rinciples, people, and policies
L and planning and pressures
A pproaches
N atural resource planning tools

N2: Comprehensive Planning for Natural Resource Conservation



Comprehensive planning tools can be used to protect natural resources.

Overview

This factsheet provides an overview of comprehensive planning. It explains the tools and processes required for comprehensive planning and discusses the benefits of protecting natural resources.

What is Comprehensive Planning?

Planning can be described as "a comprehensive, coordinated, and continuing process, the purpose of which is to help public and private decisionmakers arrive at decisions that promote the common good of society" (Whitehall Township Planning Commission 2004). Planning attempts to better organize a place that is complex, interrelated, and changing. It involves using information to provide the most rational and efficient strategies about land use, human and environmental health, economic development, and other components of a community. Comprehensive planning attempts to understand and guide community development and change in order to eliminate or reduce the negative and accentuate the positive qualities of community life. Comprehensive planning involves many important elements:

- State support and empowerment of municipal and county planning efforts through court decisions, enabling legislation, and technical and financial assistance.
- A comprehensive view of a place and the ability to put many elements of community life together while dealing with economic and other change.
- Valid economic, social, and environmental information to develop a comprehensive plan that guides future growth and investment.
- Police power regulatory tools (zoning and land development ordinances) and nonregulatory tools (developer incentives and public purchase) to carry out the comprehensive plan.
- Review and modification of development proposals in relation to the comprehensive plan as well as other factors, including zoning and other regulations, public sentiment, and coordination of municipal departments and functions.

Forest Service
Northeastern Area State and Private Forestry
11 Campus Blvd., Suite 200
Newtown Square, PA 19073
October 2014
http://www.na.fs.fed.us

NA–TP–01–14 N2
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- Elected officials, developers, and civic leaders who understand and support the benefits of comprehensive planning.
- The review, modification, variance, and appeal of development decisions and policies.

The Planning Process

Planning processes are commonly used to develop plans and policies as well as in ecosystem management and other management scenarios. Depending on the situation, conflict resolution tools such as facilitation may be required to move planning forward. One example of a planning process is the Model for Rational Decision Making, which has these components:

1. Formation of the planning group, including all people interested, important, and impacted.
2. Mutually agreed-upon identification of problems and opportunities.
3. Greater understanding of issues through research and information gathering and analysis.
4. Use of group techniques such as brainstorming to develop goals and objectives for alleviating problems and optimizing opportunities.
5. Use of group techniques to develop alternative strategies and actions to attain agreed-upon goals and objectives.
6. Use of cost/benefit and other analyses to prioritize and choose appropriate strategies and courses of action.
7. Evaluation of strategies and actions taken in terms of progress towards goals and objectives.
8. Adjustment of goals, objectives, strategies, and actions. If done in a timely fashion, the last two elements—evaluation and adjustment—are the basis for adaptive management.

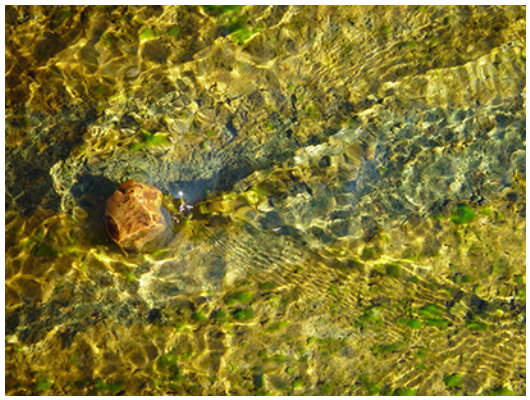
Planning Reduces Municipal Costs

Comprehensive planning reduces the costs of change and development for a municipality. It seeks to shift some of the costs from the municipality to the people and organizations investing in community development. Comprehensive planning can influence four types of costs:

1. **Direct costs.** These involve issues that require public revenues to manage or correct, including problems with stormwater and flood control, wildfire, and steep-slope development.
2. **Indirect costs.** Depending on the size and demographic makeup of development (for example, a housing development with many children), the costs of public services (education, police, health care, social services, and roads) can exceed revenue from property and other taxes.
3. **Loss of value.** This involves issues that cause public and private property values to depreciate. An example is the negative impact on the property value of single family homes if a large industrial development is placed next to them. Conversely, careful planning and proper regulatory policy can preserve and increase property values.
4. **Failure to secure private investment.** Well-planned communities attract business and people and their financial and human investments.

Comprehensive Planning and the Environment

Today, impacts such as fragmentation, isolation, and destruction of natural resources by sprawling suburban and rural development and unguided land use are a great concern. The old development philosophy of find it, fill it, and move on is now widely rejected as



A comprehensive plan is a powerful tool to incorporate healthy natural systems into community growth and development.

dysfunctional. Poor planning and development can degrade the ecosystem processes and services provided by forests, streams, and wetlands. In addition, there are the potential costs of environmental hazards such as fire and flood. Given the localized nature of planning in the United States, individual and multimunicipal use of comprehensive planning is a powerful tool to preserve and incorporate productive and healthy natural systems into community growth and development.

The impacts of fragmentation, isolation, and destruction of natural resources by sprawling suburban and rural development and unguided land use are a great concern.

Environmental Planning

Environmental planning is the theory and practice of making sound, interrelated decisions about the natural environment (open space, wildlife, air and water, and fire and other natural hazards); working landscapes (water, farm, and forest); and the built environment (parks, greenways, and open space). Important concepts include using natural resource inventories; considering the environment in comprehensive plans and zoning; preserving sensitive and productive natural areas; placing development in places that are less environmentally sensitive; and planning and designing to bring people together in the best relationship with each other, development, and the environment.

What is Green Infrastructure?

Green infrastructure is the interconnected network of natural areas that conserves natural ecosystem processes and functions. Connectivity is the key. It is the ecological framework for environmental, social, and economic health and the framework for both development and resource conservation. It should be planned for and financed like roads, utilities, and other community infrastructure.

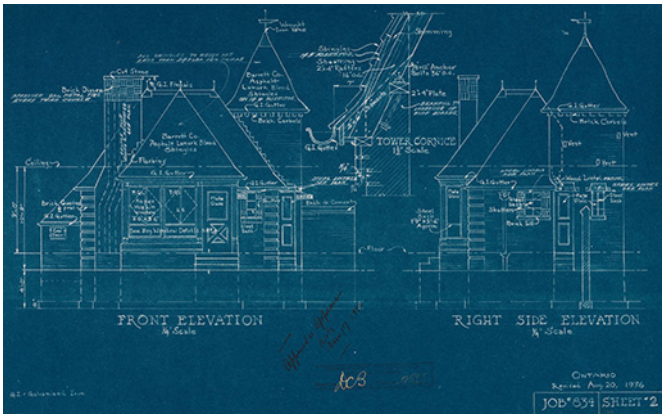
Challenges for Planning to Conserve Natural Resources

Despite the promise, there are many constraints on the ability of planning and regulatory policy to conserve natural resources:

- The autonomous history and nature of planning and regulatory policy by municipalities. Wildlife habitat, streams, watersheds, and other environments typically do not match municipal boundaries. Environmental planning by individual municipalities is usually at too small a scale to be effective.
- Smaller, more rural places under new and intense development pressure often do not have the resources or capacity to plan when rapid change occurs. Planning is reactionary.
- Some States do not require municipalities to complete comprehensive plans; if they do, they may not require municipalities to consider natural resources.
- Natural resource inventories are often not completed at municipal or larger scales.
- Sometimes, zoning and subdivision and land development ordinances work against resource conservation by not allowing such practices as clustered density or flexible lot sizes, setback distances, and street width.
- Generally, most citizens and municipal leaders do not clearly understand or appreciate the economic and human health values of ecosystem processes and services provided by natural resources.
- With working families, long commutes, and other conditions of modern life, there is a trend of citizen apathy towards growth and development until a threat is imminent—when the bulldozers are in the forest. By this time, it is often too late to have any substantial impact on an approved development. That's one reason why it's so important to perform comprehensive planning that sets regulatory policy well in advance.

What Makes a Comprehensive Plan?

A comprehensive plan is a growth management plan that incorporates many things—community input, background information, cost/benefit analyses and other studies, and assumptions about future change—to create policies and strategies for community development and investment. It attempts to identify and demonstrate a community's future economic, social, and environmental desires. A comprehensive plan also provides logical and legal justifications and purposes for using police power authority such as a zoning ordinance. It attempts to rationalize the use of zoning and other growth management tools well in advance of sometimes uncertain change.



A comprehensive plan is not a blueprint for future development. It helps organize the many elements of community development in a dynamic and changing world.

There are many continuing interactions in communities such as new homes, roads, water supply, and recreation. There are also many internal and external forces that impact communities such as natural disasters, national and global economies, and the price of oil and gas. A comprehensive plan is not a blueprint for future development. It is a scenario to help organize the many elements of community development in a dynamic and changing world.

Many States require municipalities and counties to amend their comprehensive plans every decade or so. Communities are dynamic; plans are often static. To help make plans as dynamic as possible, many planners recommend that planning commissions pick and discuss important and changing issues such as traffic, education, and public safety each year and make changes to policy and strategies in light of change.

Communities are dynamic; plans are often static. Pick and discuss important and changing issues each year and make changes to policy and strategies as needed.

There are three important sections in a comprehensive plan. **Background Information** provides a general understanding of a community by describing its environmental, cultural, historic, economic, and other important features. **Goals**, **Objectives**, and **Policies** relate those features to a **Vision** for the future development of the community. **Plan Chapters** (**Elements**) discuss in detail the pieces of community development such as land use, transportation, community facilities, and resource conservation.

The Transportation chapter of a comprehensive plan shows all major transportation systems, including bike paths.

Comprehensive plans have a number of common elements. The **Land Use** chapter uses text and maps to show current and future land uses such as residential, commercial, industrial, agricultural, and forest. Land use maps are the basis for understanding current and future growth and enacting a municipal zoning ordinance. Zoning is not planning; it is a tool to carry out planning. The **Transportation** chapter discusses and shows all major transportation systems, including roads, bus routes, bike paths, and greenways, and how they are connected and coordinated. The **Community Facilities** chapter addresses the need for and location of schools,

fire stations, libraries, parks, and sewer and water services. This is especially important because development often follows the provision of water, sewer, and transportation infrastructure; it is these elements that can be used to shape the location and velocity of future growth. **Energy Conservation** discusses the use of building materials, solar access, transportation, recycling, energy audits, and other energy efficiency measures. **Capital Budget**, a crucial element of any plan, outlines the public and private investment required to fund facilities and programs.

Communities can use water, sewer, and transportation infrastructure to shape the location and velocity of future growth.

The first step in protecting open space, water, wildlife habitat, productive forests, and other resources is to consider these environmental features in the comprehensive plan. If these features are not discussed in the plan, they will most likely not be adequately considered in capital budgeting, regulatory policy, or development review.

Comprehensive plans have a number of common environmental chapters. **Urban Forestry** discusses using trees to mitigate stormwater and other impacts, tree canopy coverage and coverage goals, tree risk assessment and management, policies and strategies to support public tree planting, tree maintenance and removal, and the use of volunteers and partners. **Conservation** typically identifies such features as riparian areas, steep slopes, ridgelines, and wetlands, and discusses the ecosystem services they provide, the importance of conserving those features, and regulatory tools that can be used to conserve them. **Viewshed** addresses using zoning and development design to protect ridgeline, lake shore, and other important views in and out of a community. **Open Space** addresses such things as existing preserved space, natural areas desired for preservation, connection of areas, prioritizing the acquisition of future areas, using regulatory and nonregulatory strategies such as zoning and bond issues for acquisition, and management tools such as multiple-use trails and docent programs.

The Conservation chapter of a comprehensive plan identifies features such as wetlands. (Photo: http://www.epa.gov)

Wildfire Management considers using zoning, building codes, and landscape ordinances to reduce fire risk and increase defensible space. This chapter may also consider including fire protection agencies in subdivision and other development review, the capacity and coordination of fire agencies in fire risk reduction and suppression, water supplies, using strategies to reduce fuel such as controlled burning and vegetative removal, and public education about fire prevention and the possible need for controlled burning and other controversial tools.

Stormwater discusses the costs of managing stormwater and using structural and nonstructural tools such as bioretention basins and clustered development to lower stormwater amounts and costs. **Forest and Landscape Stewardship** discusses techniques to bring people together to address preserving productive forests and other natural resource issues of mutual concern. This chapter can provide a common vision and strategies for natural resource conservation, discuss partnerships and other tools for coordination, identify regulatory and nonregulatory implementation strategies, and outline tools for monitoring and evaluating environmental quality.

The Stormwater chapter of a comprehensive plan discusses using tools such as bioretention basins to capture stormwater runoff.

Duties and Powers of Planning and Other Commissions

Although planning and other commissions can be given authority by elected officials to approve subdivision and other development plans, they most often serve as a vehicle to ensure that the viewpoints and concerns of citizens are considered and to advise elected officials about proposed and future development. Typical duties and authorities of planning commissions include preparing and reviewing the comprehensive plan; preparing and amending ordinances (e.g., zoning, subdivision and land development, and planned residential development); promoting public support and understanding of the planning process; holding public hearings and presenting testimony; and preparing environmental, water, and other studies. In many States, the planning commission administers municipal subdivision and land development ordinances by reviewing and commenting on development proposals. In fact, a common complaint from planning commissioners, especially in smaller municipalities, is that they do not plan for the future, but rather only review subdivision and other development proposals.

Zoning hearing boards often serve as an appeals board for decisions made by the municipal zoning officer. Environmental advisory councils advise elected officials on environmental programs and the conservation and purchase of open space. Tree commissions administer a municipality's street and park tree ordinance; oversee the activities of a community tree program; and act as an adjudicatory or appeals board for public tree planting, pruning, and removal permits.

Multimunicipal and Regional Planning

Cooperation among multiple municipalities to manage water and sewer, police and fire, recreation, library, and other services is common in the United States. This is done by forming legal entities called "authorities," which provide more efficient administration as well as wider service areas and revenues. Authorities can also often raise bond and other funding based on their own earning potential, separate from individual municipal debt limits. Although authorities are common, multimunicipal/regional planning and zoning are not.

The merits of regional planning have been advocated since the creation of the American Regional Planning Association in the 1920s by Lewis Mumford and others. These merits include better environmental planning and preservation, better planning for fire and other environmental risks, better planning for recreation and other public services, better siting and connection of land uses, increased ability and efficiency in administration, and increased funding opportunities.

Regional planning has been championed since the American Regional Planning Association was created in the 1920s. (Photo: San Jose State University Urban & Regional Planning)

Although there are some notable success stories (for example, the Tahoe Regional Planning Commission in California that works with municipalities and counties in two States to protect the water quality of Lake Tahoe through development, wildland fire, and other policy), regional planning continues to be problematic for a number of reasons:

- Elected officials are elected to serve only a certain municipality.
- Weaker municipalities may not receive their fair share of commercial and other desirable land uses.
- Municipalities with historical friction and animosities will not work together.
- Municipalities could be forced to share tax revenues from commercial and other development.

To address those concerns, some States have authorized multimunicipal planning in their planning codes. As an example, the Pennsylvania Municipalities Planning Code provides authority for multimunicipal planning and zoning. Basically, one or more municipalities are authorized to carry out a joint comprehensive plan and to enact, amend, or repeal joint zoning. Multimunicipal zoning must be based on a joint comprehensive plan developed by a joint planning commission. Both the joint plan and zoning ordinance must be adopted by vote of the elected officials in each of the cooperating municipalities. The entire area within cooperating municipalities must be zoned, although the municipalities can either form a joint zoning hearing board or keep separate hearing boards.

In Pennsylvania, multimunicipal planning and zoning can also be established by Intergovernmental Cooperative Planning and Implementation Agreements between municipalities. These formal agreements are highly negotiated, with all regulatory authorities and financial obligations and gains clearly spelled out for each partner. Multimunicipal plans established through these agreements may do any or all of these things:

1. Zone for or accommodate all recognized land uses within the jurisdiction of the agreement, not just within individual municipalities.
2. Designate and regulate development with area-wide significance.
3. Establish provisions for sharing tax revenues.
4. Designate and regulate growth or service limitation areas.
5. Designate and regulate area-wide conservation of historic and natural resources.
6. Establish "transfer of development" rights between slow, low-density growth areas like rural resources and faster, high-density growth areas.

Communities in Pennsylvania can engage in multimunicipal planning through either the authority they receive from the Pennsylvania Municipalities Planning Code or by establishing an Intergovernmental Cooperative Planning and Implementation Agreement with other municipalities.

Case Study — Lancaster County, Pennsylvania Smart Growth: Conserving Natural Resources

In the 1980s and 1990s, Pennsylvania's Lancaster County experienced high rates of development and growth. Today, managing that growth, which includes conserving natural resources, is an important planning function.

Two of Lancaster County's comprehensive plan elements call for zoning language that will strengthen natural resource conservation and enhancement. The plan's Growth Management Element (*Balance*) states a need for environmental ordinances, in part to carry out the goals and policies of the county's Rural Strategy, which seeks to focus new development in already developed areas. The greatest emphasis on natural resource conservation comes from the plan's Green Infrastructure Element (*Greenscapes*), which recommends environmental protection standards to support the comprehensive plan's green infrastructure goals.

County planners consider the protection of woodlots and other individual natural resources, in addition to entire landscapes, in a holistic approach to resource planning and conservation. Large-scale, restrictive use zoning is advocated to conserve riparian areas and other larger contiguous landscapes of natural importance. However, many individual resources are woven throughout urban, suburban, and rural areas alike, necessitating protection standards that apply wherever natural features exist.

Following success with both agricultural and conservation subdivision zoning, the Lancaster County Planning Commission has developed two zoning tools for municipalities to consider integrating into existing zoning ordinances: a collection of *Natural Resource Protection Standards* and the *Model Conservation Zoning District*. Both are focused on incorporating natural resource assessment and protection into subdivision and other development proposals through site-specific design and performance standards.

The *Natural Resource Protection Standards* contain a broad list of resource types discussed in Greenscapes. Assessment criteria and protection standards are provided for forest blocks and interior forests, karst topography, natural heritage areas, riparian corridors, steep slopes, highly erodible soils, unique geologic features, and wetlands. A municipality can use the protection standards to help conserve specific resource types throughout its boundaries. The *Model Conservation Zoning District* is useful for carrying out planning goals in larger scale, distinct landscapes.

Ideally, a municipality's use of both the underlying conservation district and the natural resource protection standards will result in both broad and targeted conservation benefits, respectively. As an example, increasing emphasis on improving Lancaster County's water quality requires regulatory and voluntary measures in both urban and rural settings. Conservation of larger connected features like riparian corridors and wetlands, as well as protection and enhancement of more isolated forest blocks, plays a vital role in restoring surface and groundwater resources.

The Lancaster County Planning Commission began a project to help people visualize the seven different types of development that are included in their comprehensive plan. (Illustration: Lancaster County Planning Commission 2013 Annual Report)

For more information about planning efforts in Lancaster County in 2013, visit this Web site: http://pa-lancastercountyplanning.civicplus.com/documentcenter/view/262.

Relevant Factsheets

P5 – *Principles of Ecosystem Services* – Planning will protect ecosystem processes and increase the values of the services they provide.

L2 – *Scales of Planning: From Landscapes to Ecosystems* – Provides an overview of different levels of planning and discusses past and current drivers that have influenced scales of planning.

L3 – *How Planning is Put into Practice* – Further explains the role of planning commissions and how planning practices vary from State to State.

A1 – *Using Smart Growth Principles to Plan Sustainable Communities* – The comprehensive plan should express the tools and concepts of smart growth.

N3 – *Regulatory Approaches to Protecting Natural Resources* – The comprehensive plan provides a logical basis for regulatory tools. These tools are used to carry out the comprehensive plan.

N4 – *Nonregulatory Approaches to Natural Resource Conservation* – The comprehensive plan should discuss capital budgets, citizen education, and other nonregulatory approaches.

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Acknowledgements

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Changing Landscapes

Land use planning curriculum for natural resource professionals

P rinciples, people, and policies
L and planning and pressures
A pproaches
N atural resource planning tools

N3: Regulatory Approaches to Protecting Natural Resources

Communities can use municipal and county regulatory tools to protect natural resources before, during, and after development. (Photo: Marc Roberts, U.S. Forest Service)

Overview

This factsheet explains the difference between regulatory and nonregulatory approaches to natural resource conservation. It briefly discusses the Federal policies that authorize and drive State and local regulatory policy. Discussion centers on commonly used municipal and county regulatory tools and how they are used to protect natural resources before, during, and after development.

Natural Resource Protection

Natural resource protection has become increasingly important as development and land conversion negatively impact ecosystem processes and services to municipalities. There is a wide range of regulatory and nonregulatory approaches that are used to carry out comprehensive planning with the objective of protecting natural resources. Regulatory approaches are mandated by municipal zoning and other ordinances, whereas nonregulatory approaches are voluntary and often provide incentives to developers.

Regulatory approaches to protecting natural resources are often strongly correlated with the value a community puts on its natural resources. When the protection of sensitive and threatened landscapes is a high conservation priority at a local level and there is strong political will to see this happen, using both regulatory and nonregulatory approaches to protecting resources often brings the best results.

Regulatory approaches to protecting natural resources are often strongly correlated with the value a community puts on its natural resources.

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Federal Regulatory Policies

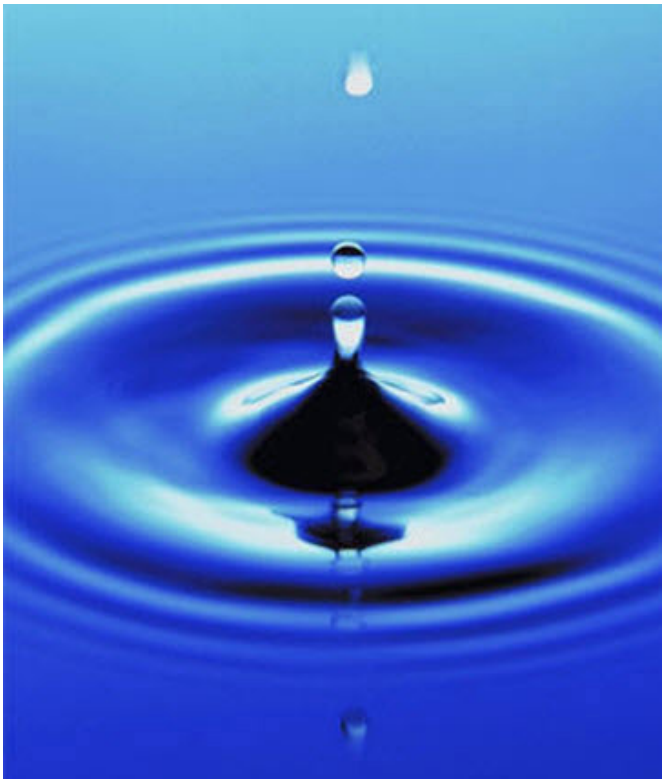
Because Federal laws mandate and authorize natural resource protection at the State and municipal level, Federal regulatory policies are briefly discussed here. A companion factsheet (P2) titled "Policies that Direct Natural Resource Planning" provides a much more indepth overview of State and Federal policies. Natural resource professionals should be familiar with the following Federal policies that impact all the work they do in some way. The following is a brief overview of some of the most common laws.

Clean Water Act (CWA)

This law defines EPA's responsibilities for restoring and maintaining the chemical, physical, and biological integrity of U.S. waters. States carry out its mandate through a variety of programs aimed at preventing point and nonpoint pollution sources, assisting publicly owned water treatment works, and maintaining the integrity of wetlands.

Safe Drinking Water Act (SDWA)

This law defines EPA's responsibility for setting national health-based standards for drinking water quality and overseeing State, local, and private water suppliers who are mandated to follow those standards.



The Clean Water Act defines the EPA's responsibilities for restoring and maintaining the integrity of U.S. waters. (Photo: http://www.epa.gov)

Federal Endangered Species Act of 1973

This law defines the responsibilities of the U.S. Fish and Wildlife Service and the National Oceanic and Atmospheric Administration for providing a program for conserving threatened and endangered plants and animals and the habitats in which they are found. Critical habitat is designated for each species, and actions within critical habitat areas are regulated at the State level.

Federal Emergency Management Agency (FEMA)

This Agency's floodplain delineations protect natural floodways from development and ensure that floodplain systems can function as nature intended. Because local and State development reviews require the adoption of FEMA floodplain boundaries, in reality this represents resource protection.

Army Corps of Engineers Water Resources Development Act of 1999

This law establishes a Flood Hazard Mitigation and Riverine Ecosystem Restoration Program that gives regulatory authority to the Army Corps of Engineers to buy out property owners in floodplain areas and return these areas to functioning floodplain systems.

National Wetlands Inventory
Administered by the Army Corps of Engineers, this provides provisions to limit and even prevent development impacts on Class 1 and 2 wetlands to ensure a level of protection for the ecosystem services they provide.

Food, Conservation, and Energy Act (Farm Bill)
This is an Executive Order that defines the USDA's responsibilities for governing the bulk of Federal agriculture and related programs. It addresses commodities, resource conservation, nutrition, credit, rural development, research, forestry, energy, horticulture and organic agriculture, livestock, crop insurance, commodity futures, trade, and taxes.

The National Wetlands Inventory helps ensure a level of protection from development for wetlands. (Photo: Steve Hillebrand, U.S. Fish and Wildlife Service)

Environmental Impact Statements
The National Environmental Protection Act requires projects supported with Federal funding or on public lands to have an appropriate level of environmental protection as part the project design and implementation process.

Zoning and Other Regulatory Tools

While State and Federal laws and enabling legislation provide a foundation for natural resource protection, in almost all States, municipalities are ultimately responsible for zoning and other regulatory strategies that can be used to conserve natural resources at local and site scales. Municipalities carry out this local policy through zoning and subdivision and land development ordinances.

In nearly every State, municipalities are ultimately responsible for zoning and other regulatory strategies to conserve natural resources.

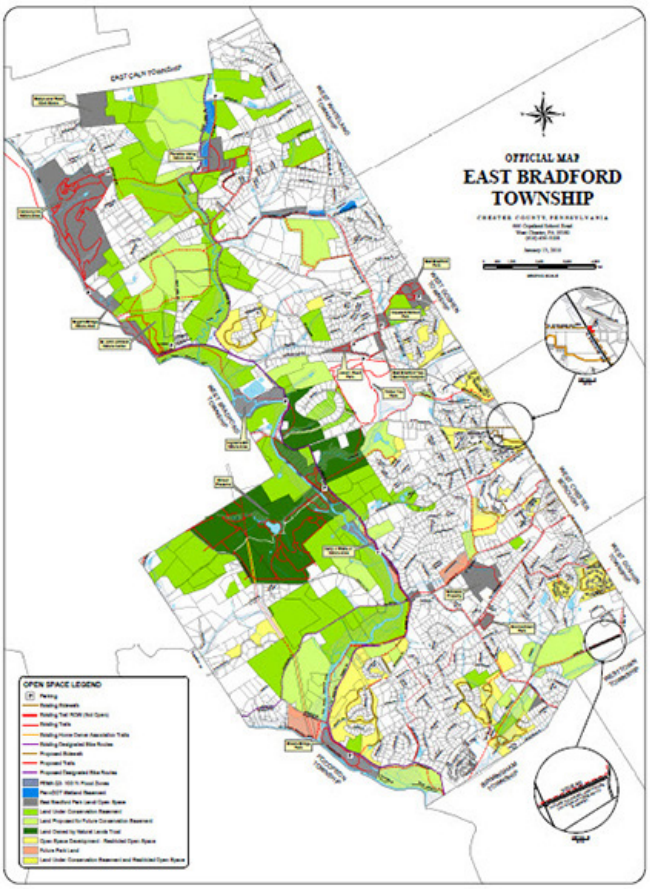
Zoning often identifies riparian area, wetland, and other conservation zones where development densities are restricted or development is altogether restricted. Subdivision and land development ordinances provide standards for subdivision design and infrastructure, and even require landscaping that uses only native plant species. Local ordinances can contain very specific provisions, such as requiring that a percentage of the total acreage of a parcel be retained as a conservation area or the distance development can occur from streams, steep slopes, or hydric soils.

Comprehensive planning is not regulatory! Comprehensive planning provides a legal and logical rationale for the use of zoning and other police power authorities. It should be a municipality's first step in protecting natural resources. A comprehensive plan can identify and map areas to be protected and outline regulatory and nonregulatory tools for protecting them. These planning objectives are then achieved through zoning, subdivision and land development ordinances, and nonregulatory tools such as land purchase and other public and private investment. Communities can prepare more specific companion plans (open space, green space). Open space plans are commonly used as a supplement to comprehensive plans that specifically target the protection of natural features such as woodlands, fields, wetlands, streambanks, floodplains, and unique landforms.

The following is a discussion of regulatory tools that are commonly used at the municipal and county level to protect natural resources.

Zoning is an important tool that communities use to carry out their comprehensive plan. It is one of the most direct and effective ways a community can protect its natural resources. Zoning can regulate the use of land and development densities. It can set standards for building use and size, designate areas where grading and soil movement can occur, and identify where riparian areas and other natural resources should be protected.

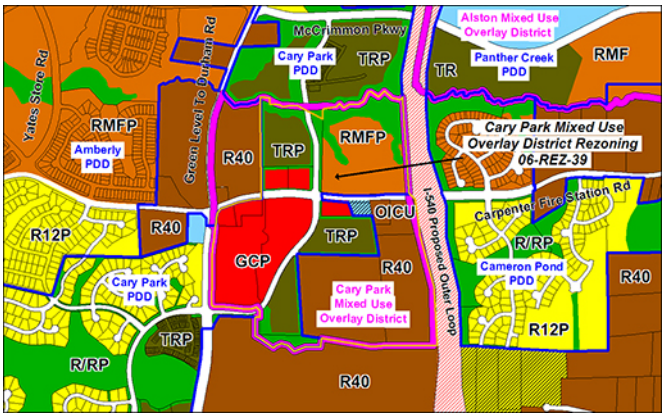
Official Maps are authorized by many States and adopted by local ordinance. They show where land is needed for future public facilities such as roads, parks, greenways, and civic buildings. For instance, if an official map designated a corridor for a future greenway and a property owner then showed intent to develop the parcel by applying for a land development or subdivision permit, the municipality then has 1 year to purchase the property shown on the official map at fair market value to put together all the land needed to develop the greenway.



Official maps show where land is needed for future public facilities. (Map: http://www.conservationtools.org)

Zoning Districts enable communities to delineate conservation areas and then regulate the type and density of land development in that district. Forest reserve, rural resource, or sensitive natural area districts are common examples. For example, a forest reserve district limits land use to forestry and recreation while preventing residential development within its boundaries.

Overlay Districts or Special Classifications are zoning districts that float over other districts and outline additional regulations that modify or supplement the underlying zone. Overlay districts can manage or protect development in or near environmentally sensitive areas, such as steep slopes, wildlife habitat, riparian areas, or floodplains. Common overlay district requirements include building setbacks, density standards, lot size requirement, impervious surface cover limits, grading restrictions, and the preservation of existing vegetation.



Overlay districts float over other districts and outline additional regulations that modify or supplement the underlying zone. (Map: http://www.townofcary.org)

The **Urban Growth Boundary (UGB)** is a boundary line that is designated in a comprehensive plan that marks the limit between desired growth areas and areas where growth and development are not encouraged. A UGB usually defines a limit where the full range of water, sewer, roads, and other infrastructure is available to new or existing development. Development is directed within the urban growth boundary area without the added cost of expanding existing infrastructure. Urban growth boundaries provide for orderly development, protect agriculture and forest industries, and limit the encroachment of development into fragile resource areas.

Urban growth boundaries are also known as Service Limitation Boundaries. In some States they have been formally established by zoning provisions that limit development density and allow for Transfer of Development Rights.

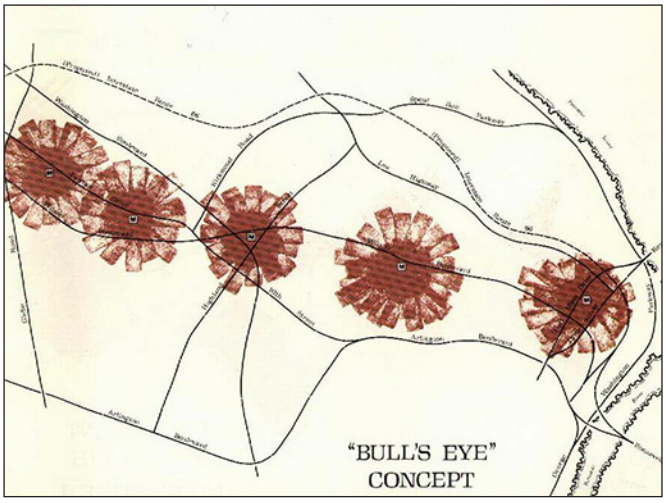
Transfer of Development Rights (TDR) is a development density distribution program established through zoning that provides landowners an incentive to sell their development rights. While the seller of development rights still owns the land and can continue using it for farming, forestry, or recreation, a conservation easement is placed on the property that prevents further development. The purchaser of the development rights can use these rights to increase the density of development at another location more suitable for development—the receiving area. TDR programs can be used to permanently protect blocks of forest, wildlife habitat, productive farmland, or other significant resources. TDRs are often used in conjunction with Urban Growth Boundaries to allow landowners to make reasonable use of property outside the growth boundary.

Transfer of Development Rights programs can permanently protect blocks of forest, wildlife habitat, productive farmland, or other significant resources.

Impervious Surface Thresholds are imposed by zoning and stormwater management regulations. They set maximum limits of impervious surfaces usually expressed as a percentage of lot size. They ensure the natural movement of water to maintain natural drainage patterns, encourage the use of green infrastructure and Low Impact Development to address stormwater management, and ensure that adequate vegetative cover is maintained on developed sites.

Concentrated/Clustered Density Zoning is used to provide higher density development in specific areas of a parcel or in growth centers. Concentrated density zoning is used to cluster residential density on smaller lots and/or require infill development, which focuses new development into developed areas. Concentrating mixed-use, high-density development promotes the most efficient use of roads and other infrastructure and can keep development from intruding on critical open space and natural areas.

Clustered density zoning is used for conservation subdivisions, which is an alternative approach to dividing parcels that locates lots away from existing natural and cultural features. This approach preserves a substantial amount of the site (at least 50 percent) as permanently protected open space by grouping homes on the developable portions of the land. Conservation subdivisions achieve the same or higher overall density levels as conventional subdivisions by reducing minimum lot sizes.



Arlington County, Virginia, developed a general land use plan that concentrates the highest density uses within walking distance of Metro stations using a "bull's eye" approach. (Map: http://projects.arlingtonva.us/planning/smart-growth/rosslyn-ballston-corridor/)

Conditional/Special Use Permits are established in a standing zoning ordinance and require that identified projects meet additional review and conditions during the permitting process. Conditional/Special Use is a granted approval that allows a land use in a zoning district that is not a permitted use. The conditional use can be granted if, after a public hearing, the use is found not to be injurious to the public interest. Reasonable approval conditions can be required, including defining hours of operation; limiting parking, signage, and lighting; defining lot sizes; or requiring additional landscaping. An example of a common Conditional/Special Use is allowing buildings such as a church or community center to be located in an area zoned for residential use.

Ordinances

Subdivision and land development ordinances provide permit applicants with modifications and waivers. A modification is a modification of a standard; a waiver is the deletion or radical change to a standard. Zoning ordinances provide for variances and curative amendments.

A zoning variance is requested when an applicant seeks permission to do something that does not conform to the existing zoning ordinance. A variance overrides an existing zoning ordinance if it is found that not granting the variance will result in unnecessary hardship on the property owner. A review board hearing a variance application typically requires the applicant to make the following three findings:

1. There are unique conditions peculiar to the properties that disallow development.
2. The applicant did not create the hardship.
3. The variance will not alter the essential character of the neighborhood or zoning district, hamper development of adjoining properties, or be detrimental to the public welfare.

The granting of a variance can include reasonable conditions such as grading restrictions, limiting vegetative removal, and others.

The curative amendment process allows landowners to challenge, on substantive grounds, the validity of a zoning ordinance or map (or any provision thereof) that restricts or prohibits the development of land. This process is usually a last resort for a property owner because it is a challenge to the substance of the ordinance. When elected officials or other review boards are deciding a curative amendment, other factors are often considered besides the property owner's challenge; these include the suitability of the site for the intensity of use and the impact of the proposal on the site's slopes, woodlands, wetlands, stormwater, or fire safety.

Ordinance Cures

Municipalities with zoning and subdivision and land development ordinances almost always provide for permit applicant relief when ordinance provisions are shown to be unreasonable, cause undue hardship, or when an alternate standard can provide the same or better result. These "cures" are provided for in the standing ordinance to which they pertain.

Appeal processes are provided to both permit applicants and those impacted by permit decisions. Certain municipal boards, such as Zoning Hearing Boards, Zoning Boards of Appeals, and Planning Commissions, are authorized to hear appeals of administrative decisions. Further appeals processes are applicable by law and may include elected officials and county court.

In addition to cures provided in municipal ordinances, States can become directly involved in municipal zoning ordinances when an ordinance is challenged by a property owner as being oppressive and/or arbitrary. An example is Pennsylvania's ACRE Law: Regulation of Normal Agricultural Operations. Under this law municipal zoning ordinances can be challenged for unduly impeding agricultural operations, including forestry. If a challenge is accepted, the State Attorney General's Office will negotiate, or even file suit, with a municipality for amendment of the ordinance in question.

Riparian Area and other Buffer Zones impose specific, minimum setback distances between development and areas of environmental concern such as wetlands, riparian areas, and wildlife habitat. For example, a strong riparian area ordinance requires protection in two zones of the riparian area. Resource Protection Zone 1 prevents disturbance of vegetation or soil 25 feet from the top of a bank; Resource Protection Zone 2 limits disturbances for an additional 75 feet with special conditions or engineering practices. Setbacks can be increased for steep slopes or high-quality stream orders. Buffer zones are used to protect natural areas from development and related encroachments such as grading, vegetative removal, roads, or driveways.

Buffer zones establish minimum setback distances between development and environmental areas such as wetlands. (Photo: http://www.epa.gov)

Zoning can include **Tree Preservation and Removal Standards**. These standards can prohibit clearing trees on steep slopes; establish setback distances from water bodies; set maximum thresholds for clearing lots; and preserve woodlots and significant groups of trees, even historic trees.

Timber Harvest Ordinances regulate forestry operations in a few States. These municipal zoning ordinances require timber harvest plans that delineate how trees are to be harvested and regenerated, the construction of roads and landings, the construction of sediment and erosion control devices, and harvesting amounts and setbacks adjacent to riparian areas and wetlands. Timber Harvest Ordinances also regulate the use of public roads by truck traffic, hours of operation, and treatment of residual trees for fire prevention.

Steep Slope Ordinances protect slopes from grading, vegetative clearing, and development. Development is often restricted on slopes over 25 percent, while limited development is allowed with conditions on slopes between 20 and 25 percent. Steep slope ordinances can require the use of grading plans, step-down foundations, and other engineering and architectural tools. They are used to enhance groundwater recharge, reduce erosion, and protect the site from landslide, fire, or other disaster.

Section 1003. STEEP SLOPE CONSERVATION

A. Steep slope areas shall be preserved in their natural state whenever possible. Where construction of roads, buildings, driveways, or infrastructure cannot be avoided, disturbance shall be kept to the minimum necessary and, in no case, shall it exceed the following permitted disturbance limits:

1. Moderately Steep Slopes - No more than thirty-five (35) percent of moderately steep slopes shall be regraded, cleared, built upon, or otherwise altered or disturbed.
2. Very Steep Slopes - No more than twenty-five (25) percent of very steep slopes shall be regraded, cleared, built upon, or otherwise altered or disturbed.
3. Steep Slope Margins - No more than twenty-five (25) percent of steep slope margins shall be regraded, cleared, built upon, or otherwise altered or disturbed.
4. Prohibitively Steep Slopes - No more than ten (10) percent of prohibitively steep slopes shall be regraded, cleared, built upon, or otherwise altered or

X - 3

The Lower Milford Township (Lehigh County, Pennsylvania) zoning ordinance includes steep slope ordinances. (Reformatted for this document on 10/7/14; Credit: http://conservationtools.org/libraries/1/library_items/762)

Prohibited Slopes are defined as those slopes with greater than a 25 percent grade. No grading, vegetation removal, or development is permitted on Prohibited Slopes. Precautionary Slopes are defined as those slopes with grades ranging between 12–25 percent. Precautionary Slopes allow limited grading, vegetation removal, and development with special conditions or engineering practice requirements.

Development Density Bonuses are given to developers in exchange for permanently conserving open space or sensitive, unique environmental areas on a parcel. Zoning regulations can permit a density bonus, which increases development density on a property up to a percentage allowed by the zoning ordinance.

Municipalities can impose **Impact Fees** on developers to help cover the cost of education, public safety, and other capital improvements that are necessary to accommodate new subdivision and other development. Municipalities can reduce or waive impact fees if a project design conserves or reduces impacts on natural resources. These fees are illegal in some States.

Subdivision and Land Development Regulations provide standards and procedures for dividing individual parcels of land into two or more lots. Subdivision ordinances focus on the design of streets, lots, and structures, and the physical layout or design of a development. They set standards for sidewalk and road width, lot size, parking lots, and other landscaping, and direct where utility rights-of-way will be located. They require the bonding of streets, landscaping, and other improvements that will be turned over to the municipality.

Subdivision regulations set standards for dividing individual parcels of land into two or more lots.
(Photo: http://csis.msu.edu/news/subdivision_biodiversity)

Subdivision and land use regulations can work with zoning ordinances to require that specific environmental standards are met, such as siting development away from riparian areas and other sensitive areas, preserving high-quality habitat areas, or protecting steep slopes.

Subdivision regulations can also work with zoning ordinances to require that subdivision projects of 5 or more acres cluster lots close together to permanently protect open space. The portion of the parcel that is not developed is restricted by a conservation easement and used for common open space. Subdivision ordinances can also require natural resource assessments, stormwater management, or other information as part of the permitting process.

Zoning Ordinance versus a Subdivision and Land Development Ordinance

Zoning ordinances are most often used to provide provisions for the location of land uses (zoning districts), density of use, open space protection, setbacks, building heights, and sizes. Subdivision and land development ordinances, on the other hand, direct the permit application process and design process. They can require the bonding of required improvements such as streets and utilities and, in most States, refer to zoning ordinances when they restrict the use of private property.

Case Study — Bennington, Vermont's Forest Reserve District

The Town of Bennington, Vermont, has delineated a Forest Reserve District as part of its zoning regulations to maintain and protect large areas of intact forest. Parcels in this district must be a minimum of 25 acres, and only commercial forestry uses are permitted. Telecommunication towers and seasonal, primitive camps of a minimal size may also be allowed after special approval from the development review board, provided that adverse impacts on the environment and scenic resources are avoided. Camps may not be converted to year-round dwellings. By limiting development and parcel size, forest fragmentation is avoided and the resource values of the district remain intact.

For more information, visit this Web site: http://vnrc.org/resources/community-planning-toolbox/case-studies/forest-reserve-district-bennington/.

A sign welcomes visitors to historic Bennington, Vermont. (Photo: http://www.wikipedia.org)

Case Study — Township of Warwick, Pennsylvania Transfer of Development Rights Program

The Township of Warwick, Pennsylvania, established its Transfer of Development Rights program in 1993. Since then, it has preserved over 900 acres, more than any other community in the State of Pennsylvania. This highly successful program is enacted through the township's zoning regulations and allows landowners of agricultural land to sell or donate their development rights. Each landowner is granted one development right for every two acres of land. Once development rights are conveyed, use of the property will be restricted in perpetuity for agricultural purposes only. In turn, developers may purchase or use these rights to increase permitted lot coverage in the Campus Industrial Zone or to increase maximum density for elderly housing developments within the R-3 Residential Zone.

The Township of Warwick (PA) has preserved over 900 acres since it established a Transfer of Development Rights program in 1993. (Web site: http://www.warwick-bucks.org/departments/planning-and-zoning-department/)

For more information, visit this Web site: http://www.ecode360.com/11671452.

Case Study — Kansas City Development Standards for Open Space and Conservation

Kansas City's development standards are an excellent example of how subdivision regulations can be used to encourage open space and natural resource design. In exchange for flexibility in lot layout and building standards, developers are required to set aside a prescribed amount of permanent open space, which can be used for recreation or natural resource protection. "Open space" developments must set aside a minimum of 30 percent of the site as open space, while "conservation" developments must delineate at least 60 percent of the site as open space.

For more information, visit this Web site: http://www.zoningplus.com/regs/kansascity/.

Kansas City, MO, uses subdivision regulations to encourage open space and natural resource design.

Relevant Factsheets

P2 – *Policies that Direct Natural Resource Planning* – Provides an overview of State and Federal policies and regulations that impact the protection and use of natural resources.

P4 – *Developing and Measuring Effective Local Policy* – Discusses the concept of policy, how it is created in local government, and how it can be evaluated. Mentions policies related to managing urban trees and fire.

A1 – *Using Smart Growth Principles to Plan Sustainable Communities* – Discusses some regulatory smart growth tools that are available.

A3 – *Managing Stormwater with Green Infrastructure* – Examines a number of regulatory tools that communities are using to support the use of green infrastructure as a solution to stormwater management.

N4 – *Nonregulatory Approaches to Natural Resource Conservation* – Describes how regulatory and nonregulatory tools can be used together and discusses how nonregulatory tools can be just as effective as regulatory tools in planning for natural resources.

N5 – *Planning for Healthy Forests and Timber Operations* – Discusses approaches to forestry-related Best Management Practices that can be integrated into comprehensive plans, zoning, and other land use regulations.

N7 – *Minimizing Parcelization, Fragmentation, and Sprawl* – Discusses some of the public and private land use practices that have contributed to these three issues. It familiarizes readers with both regulatory and nonregulatory tools that are being used to address these issues.

Resources

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N4: Nonregulatory Approaches to Natural Resource Conservation

Nonregulatory approaches can be used to conserve open space and other natural resources.
(Photo: Neal Bungard, U.S. Forest Service)

Overview

This factsheet discusses nonregulatory tools that are used to conserve open space and other natural resources. It describes how regulatory and nonregulatory strategies are used together and discusses how nonregulatory tools can be just as effective as regulatory tools in planning for and conserving natural resources.

Regulatory and Nonregulatory Tools Work Together

There are places that have successfully preserved open space and other natural resources during development using a combination of regulatory and nonregulatory tools—the city of Thousand Oaks, CA; the city of Boulder, CO; and Montgomery County, Pennsylvania. These two types of tools are not mutually exclusive and can be orchestrated for powerful conservation strategies. The many tools that have been used include resource assessment and planning, developer subsidies and incentives, tax policy, zoning, ordinances, public outreach, and partnerships. Zoning and other regulatory policy are strengthened by using nonregulatory tools. Successfully negotiating with developers and the business community, using the power of the public purse to purchase desired lands, and building support of the general public can all ensure that protecting natural resources is a key consideration during the planning process.

Resources for Partnerships and Other Nonregulatory Tools

- The Environmental Grantmakers Association provides information and links for grants. (http://ega.org/collaborate/grant-seekers)
- The Lincoln Institute of Land Policy provides information on organizations that support conservation. (http://www.lincolninst.edu/subcenters/regional-collaboration/resources.asp)
- The American Planning Association provides educational materials and training on a variety of planning issues. (http://www.planning.org/education/training/)
- The Conservation Fund provides information on planning for and conserving nature. (http://www.conservationfund.org)
- The Smart Growth Network supports community and stakeholder collaboration. (http://www.smartgrowth.org)
- The American Marketing Association provides strategies for effective marketing. (http://www.marketingpower.com)

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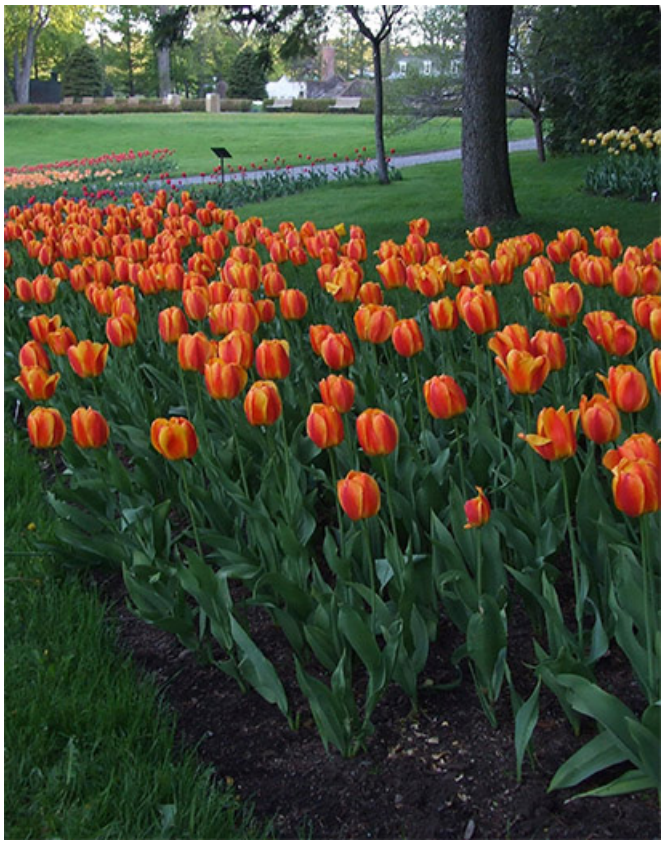
Natural Resource Assessment and Planning

Communities with successful resource conservation records have a clear understanding of where important resources are and how they are connected. They have used their natural resource assessments to develop priorities and strategies to acquire and protect these important resources. They used this information to incorporate conservation, open space , and other elements into comprehensive plans. Such plans provide a logical rationale for using zoning and other ordinances, and provide regulatory and nonregulatory strategies for resource conservation.



Communities that successfully conserve natural resources have a clear understanding of where they are and incorporate open space into their comprehensive plans, among other strategies.

Mapping the location of natural resources following their assessment provides important information on the quality and location of resources such as woodlots, riparian areas, steep slopes, and greenways. When natural resource assessments are tied to Geographic Information Systems (GIS) and merged with other GIS-based datasets, these assessments can become powerful tools that link natural resources with community infrastructure, demographics, and even economic information that can be used to support and scientifically substantiate planning decisions.

Developer and Landowner Subsidies and Incentives

Developers and others who own forest land and properties with natural landscapes are more inclined to conserve them (and the ecosystem services they provide) if they are compensated in some way for their efforts. Incentives can help developers work toward conservation goals and policies that municipalities and other agencies establish. Many subsidies and incentives, such as density bonuses and landscape credits, are tied to zoning and other ordinances, but they cannot be used unless there are regulations in place to provide a basis for negotiation. Incentives can also be designed to help manage practical resource issues such as invasive species management and wildfire fuel reduction. When considering the management of natural resources and the high-quality recreational benefits that large natural systems provide to communities, it's important that incentives for conserving these systems are available to all groups and not only developers. These incentives may be the impetus that determines whether or not natural lands are protected from development.

Incentives for conserving natural resources may be the impetus that determines whether or not natural lands are protected from development.

Density Bonus

Many municipalities allow density bonuses (increased development density) as an incentive for builders to preserve open space, steep slopes, and riparian areas. Municipalities offer density bonuses through "conditional use" provisions in zoning ordinances or face-to-face negotiation. For example, to make preservation of open space more acceptable to a developer, a municipality may choose to allow additional residential units as part of a residential cluster subdivision design. Using a Conditional Use Variance may allow a developer to encroach on a certain percentage of steep slope area if the developer agrees to provide more open space than is required. This is done because the value of the preserved open space is greater than a minor encroachment into a steep slope.

Landscape and Other Credits and Bonuses

Developers can receive credits for installing landscaping and for preserving existing trees and vegetation . Preserving trees and existing vegetation can reduce impervious surfaces, support natural resource planning, and spur innovative design and grading that may contribute to other credits and bonuses. Some municipalities allow for "in-lieu" payments for purchasing recreational property or planting and landscaping in places not directly in the development; however, these payments should be made from stand-alone accounts with clear rules about how and when such funding is used.

Developers can receive credits for preserving existing trees and vegetation.

Design Flexibility using Performance-based Ordinances and Design Waivers

Some municipalities support flexibility in design by using performance-based ordinances that allow developers to meet design requirements without detailed designs. A simple example is a landscape ordinance that requires 50 percent of the area of all parking lots to be shaded within 15 years. The developer is responsible for designing the solution to this design standard, which the municipality must review and approve. Municipal zoning ordinances can provide developers with design flexibility by allowing for Setback and Lot Averaging that allows typical setbacks and lot sizes to be varied. Additionally, if a developer can offer a better design for sidewalks, retention basins, parking, and other facilities to provide space for landscaping or preserve other natural resources, a municipality can modify or waive existing design provisions found in subdivision and land development ordinances.

Reduction of Impact Fees and Others

Municipalities can charge the developer with impact fees for the additional cost of services new development will place on a municipality; these fees cover costs associated with the need for a new school, additional fire and ambulance services, or increased traffic. Impact fees are illegal in some States, such as Pennsylvania, but are common in many other States. These fees are usually established by formula, but can be negotiated to provide incentives for certain development designs such as those that preserve trees and open space. Standing fees, such as those for sewer hook-up, can also be negotiated as an incentive for natural resource conservation. Many municipalities alternatively use impact fees and developer exactions and dedications to purchase and maintain parks and open space.

Transfer of Development Rights

The practice known as transfer of development rights (TDR) is directly related to zoning ordinances and the use of Growth Boundaries. TDR enables development density to be shifted from areas where resource conservation is desirable (the sending area) to areas that have been zoned for higher development densities (the receiving area). Underlying zoning in the sending area drives the amount of residential or other density that can be moved to the receiving area. Growth Boundaries and TDR can control the velocity of development and provide for more orderly development by restricting the provision of water, sewer, and roads in certain areas for specified periods of time. TDR has also been used as a tool to move development density away from fire-prone and other environmentally sensitive areas. One requirement for using TDR is the requirement for high-density market in the receiving area.

Clear Communications between Municipal Departments

In some places, municipal departments do not communicate well. There must be a realistic understanding and open communication related to the requirements of ordinances administered separately by planning, public works, and other departments within a municipality. As an example, the planning department may require the preservation of existing trees, while the public works department may require certain widths for streets and sidewalks. If the developer preserves the trees that the planning department demands, they cannot construct the size streets and sidewalks desired by public works. Developers can be caught between the interests of municipal departments, which can cost considerable time and money.

There must be a realistic understanding and open communication about the requirements of ordinances that are administered separately by different departments in a municipality.

Tax Policy

Tax credits and tax breaks have long been used to provide both incentives for development and support for conserving natural resources in open space or working forests. A number of tax policies can be used to conserve and manage natural resources.

Pay As You Go Tax Policies

Under this scenario, a municipality spends revenues from a dedicated tax or other funding source. Property taxes, earned income taxes, real estate transfer taxes, budget surpluses, or revenues from municipal businesses, such as the water or sewer authority, may be considered for purchasing and maintaining parks.

Property Tax

In Pennsylvania and other States, property taxes are measured in "mills," where one mill equals one dollar of tax for every $1,000 of assessed property value. In many places, property tax revenues are collected and used by three entities: the school district, the municipality, and the county. Property taxes can provide a relatively stable stream of income, but there may be a great deal of competition for their use. Voters in many States have approved property tax increases that are directly dedicated to open space acquisition, especially in areas undergoing rapid growth. State statutes oversee the generation and use of property taxes; major increases usually require a referendum.

Earned Income Tax

In Pennsylvania, State legislation (PA Act 153 of 1996) authorizes voters to approve an increase in the earned income tax above the State limit exclusively for the purpose of financing the purchase of open space. As with property taxes, this revenue can also be used as a basis for servicing an open space bond issue. Bear in mind that the revenue from tax on earned income can decline with economic turndowns or in places with a growing population of retirees.

Real Estate Transfer Tax

This tax is levied on the sale of property and increases with the value of property being sold. Costs are usually divided between buyer and seller. Revenues from this tax can be dedicated to purchasing and maintaining open space. However, applying or increasing this tax can be difficult in the face of opposition from real estate interests.

Benefit Tax Districts

Benefit Tax Districts that have been used to finance the Bay Area Rapid Transit System in San Francisco and New York City's subway system may be a model for financing the purchase and maintenance of park and open space. A benefit assessment found that Benefit Tax Districts increased land values in the vicinity of new transit lines or other public infrastructure because of the positive impact of publically financed infrastructure on property values.

The Bay Area Rapid Transit System in San Francisco was financed by benefit tax districts. (Photo: Justin Sullivan, http://www.ideastream.org/news/npr/209068284)

Special Assessments

Special assessments charge all property owners for specific municipal services such as stormwater management and public landscaping. Assessments are often levied as a per foot cost of right-of-way frontage or as a percent of property value. The city of Cincinnati uses a frontage assessment to help fund its street trees and other public landscapes. The city of Philadelphia assesses and taxes the square footage of parking lots and other nonpermeable surfaces to help subsidize stormwater utility fees and provides tax credits for the planting of trees and other landscaping.

Improvement Districts and Community Development Block Grants

Downtown and business Improvement Districts have long been used to help fund public landscapes and parks. Some cities have successfully used Community Development Block Grants to fund tree planting and public landscapes.

Property and Tax Programs

State tax programs that use tax funds to conserve forest, agricultural, and other working landscapes are an important mechanism for conservation. Many States allow tax reductions for the sale of land development rights. Both Wisconsin and Vermont have well known tax programs that have had substantial positive impacts on resource conservation.

Many States allow tax reductions for the sale of land development rights.

- **Wisconsin Managed Forest Law Program**
  This program, enacted in 1985, supports Wisconsin's forests and forest products industry by ensuring that forest land ownership remains affordable. Landowners enrolled in the program pay reduced taxes on forested property (75 to 95 percent less than typical property taxes). (http://dnr.wi.gov/topic/ForestLandowners/mfl.asp?s1=ForestTax&s2=MFL-Enrollment&inc=ftax)

- **Vermont Use Value Appraisal Program**
  Also called "Current Use" or "Land Use," this program enables landowners who practice agriculture or long-term forest management to have their enrolled property appraised for property taxes based on its value for forestry rather than its development or fair market value. (http://www.vtfpr.org/resource/for_forres_useapp.cfm)

Other States have programs similar to Vermont's. In Pennsylvania, for example, the Clean and Green Act of 1974 offers preferential tax assessment to owners of farm land and forest land by taxing land according to its current use rather than prevailing market value for development.

Estate Planning

The inheritance of property and other land transfers often break up large landholdings and fracture rural and suburban landscapes. Given rising land values, aging property owners, and Federal inheritance taxes, estate planning is a tool that landowners can use to help avoid the division and loss of property that has natural resource value.

Landowners can use estate planning to help avoid the division and loss of their property that has natural resource value.

The principal goal of estate planning is to reduce death taxes and other transfer costs. Estate planning involves identifying assets such as real estate and stock that can be counted as part of a taxable estate, and identifying future property use goals. Financially, this planning can become complicated when considering death taxes and other transfer costs, probate, and land ownership options.

Open Space Purchase and Taxes: The Central Bucks County School District Study

One question often asked when purchasing property is whether conserving open space will remove much needed income from public tax rolls. Many studies across the United States show that farmland, forest, and open space generate taxes but require few services. For example, a 1992 American Farmland Trust study of Massachusetts towns found that residential development cost more in services than it earned in tax revenue, while open space generated more in sales and other taxes than it cost to service. In 2000, Pennsylvania's Central Bucks County School District reported an annual gap, or shortfall, of $3,149 per household between the tax revenue provided by new residential development and the costs of new students to the school district. Considering this educational cost, various economic studies then showed that it would be cheaper for the school district to purchase the property or development rights for a 100-acre farm than to pay for the increased costs of education over 10 years.

There are a number of different estate planning approaches that can be used to keep properties from being broken up. Land and its control can be gifted to heirs a little at a time each year. As of 2012, cash or property equivalent to a maximum of $12,000 can be given to an individual without a Federal gift tax. Property can also be gifted to a conservancy or other nonprofit or placed in trust in a will. All or part of a property can be protected through a conservation easement, as discussed in the next section.

Public Investment

The power of the public purse to purchase property rights is another powerful tool for natural resource conservation. Private property carries a bundle of rights that include development, water, timber, mineral, agriculture, and others that can be secured under contract or purchased outright. To conserve natural resources, some or all of these rights can be purchased "fee simple" or "full fee" by government and nonprofit organizations. Fee-simple acquisition protects the natural environment by easement—the easement buyers purchase only the land rights that they desire (for example, a conservation easement would purchase only development rights). Full-fee acquisition involves purchasing and controlling the entire bundle of property rights.

To conserve natural resources, government and nonprofit organizations may purchase some rights or the entire bundle of rights held by the property owner.

In addition to purchasing property for resource conservation, growth can be controlled or guided by planning and providing for roads, water, sewer, and other infrastructure. For this reason, people concerned about resource conservation should be aware of their municipality's capital improvement programs and spending decisions as they relate to capital improvement provisions related to the construction of bridges, roads, and other infrastructure that can spur development.

Conservation Easements

A conservation easement is a flexible, negotiated contract between a landowner and a conservation organization or government agency that permanently limits the uses of the land in order to protect its conservation values. Easements are a particularly effective tool for permanently protecting land from subdivision development. Typically, easements are used to purchase the development, mineral, timber harvest, or other productive rights of a parcel, thereby eliminating its development potential. The permissible types of management and land use that can continue on the property are determined by a contract negotiated between the two parties. Depending on the terms of the contract, landowners may be able to continue farming, hunting, and living on the parcel. Since the sale of development and other property rights reduces the value of the land, easements can result in significant tax reductions. Tax benefits also occur when an easement is donated, thus qualifying as a tax-deductible charitable donation.

Conservation in the State of Maryland: Smart Growth and Neighborhood Conservation Initiative

Maryland has a number of innovative conservation easement programs, such as the Rural Legacy Program. These programs establish greenbelts of forest and farms around rural communities to preserve their cultural heritage and maintain a sense of place. An example of local efforts is the Carroll County, Maryland Agricultural Land Preservation Program, which preserves agricultural land and open space by supporting programs that compensate landowners for voluntarily restricting property from development. (http://ccgovernment.carr.org/ccg/agpres/default.asp)

Bargain Sale of Land

A bargain sale is when land is sold at a value less than its fair market value to a conservancy or government agency. This can afford the seller some savings on capital gains tax and entitle them to charitable income tax deduction.

Land Trades and Exchanges and Limited Development

Properties vary in how desirable they are for development. Conservancies and other organizations often trade smaller parcels that are desirable for development in order to consolidate larger parcels with healthier natural systems. As an example, a parcel with potential for a large residential development may be traded for a larger parcel more distant from current development that provides better ecological and recreational opportunities. Conservancies and agencies also use limited development—constructing homes on a small portion of a parcel—to fund the acquisition of that or other parcels.

Bonds, Other Borrowing, and Referendums

Municipalities can borrow from public funds using bond issues or from banks and other commercial lenders, but they must abide by a strict set of regulations. In many States, municipal borrowing is not only overseen by the State, it is also affected by the ability of a municipality to provide a stable stream of revenue to service debt, the amount of debt already accrued, and the debt limit set by the State for a municipality.

One of the major opportunities presented by a bond issue is that it provides a large amount of money quickly to purchase open space in a competitive and rising real estate market. In addition, costs are spread out over a long time frame and are borne by both current and future beneficiaries. Drawbacks of a bond issue include the accrual of financing charges and, in the case of a public referendum, the need to convince voters of the merits of incurring debt to protect land.

Given the complexities of borrowing, municipalities interested in bonds and other debt should seek advice from an experienced lending professional. Remember that any debt raised by the municipality must eventually be paid for using municipal tax, municipal authority, or other revenue source.

In many States, a referendum is not required if the proposed financing does not put a municipality over its state-mandated statutory debtor tax limits. However, referendums are often used even if the financing is below debt or tax limits as a test of the public's will. State statutes, such as the Pennsylvania Election Code (P.L. 1333, No. 320), establish the method for placing a referendum question on a ballot. There are various procedural rules regarding referendums that involve such things as passing an ordinance allowing the placement of a referendum question on the ballot, timing for filing the referendum, and wording for the referendum questions.

Successful referendums that approve the acquisition of open space and conservation easements are handled like any popular election campaign. They need to have a well-developed message and campaign strategy, especially when competing with organized opposition or other referendums on a ballot. To build support, the campaign should utilize publicity, education, and citizen committees. In some cases, this may require staff support. It will certainly require budgeting and fundraising.

Advice for a Successful Referendum Campaign

This process takes place in the political arena. Anticipate the same amount of work, fundraising, organizing, debate, and conflict as you would for any other political campaign.

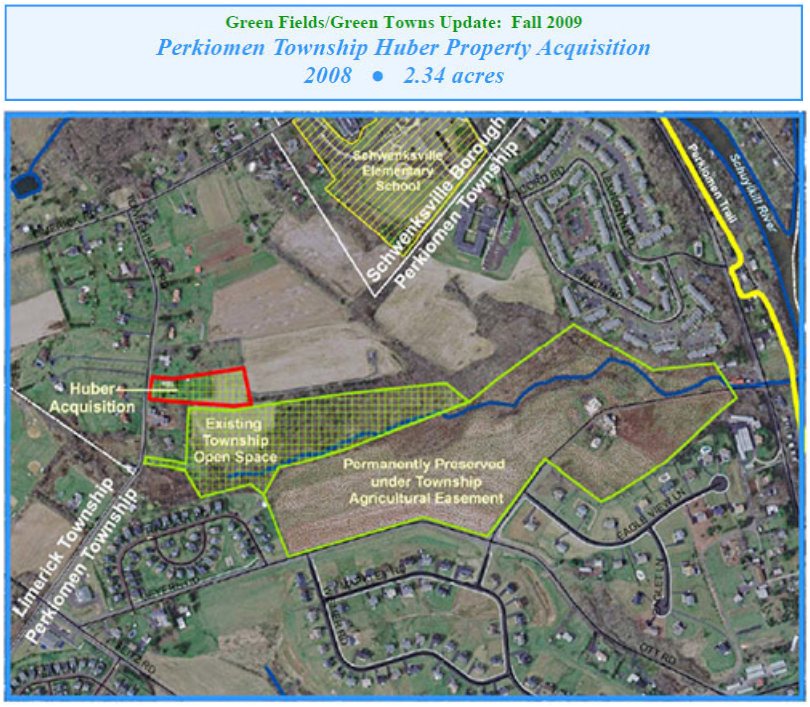
- Organize early. Allow at least 6 months. One year is better.
- Prepare your message. Keep it simple and stick with it.
- Focus on the benefits of the referendum that will be most meaningful to voters.
- Build broad support early on. Keep local officials informed and supportive.
- Build personal relationships with editors, reporters, and elected officials.
- Anticipate organized opposition.
- Fundraise early.

Successful referendums that approve the acquisition of open space are handled like any popular election campaign.

The Mount Loretto Unique Area in New York City is an example of open space that preserves this region's natural and historic character. (Photo: http://en.wikipedia.org)

Case Study — Montgomery County (PA) Green Fields, Green Towns Program

By 1993 Montgomery County and other areas of southeastern Pennsylvania were coping with high rates of development and land conversion. In some municipalities, nearly 100 percent of agricultural and forested properties had been developed. This loss of natural features caused a huge groundswell of support for natural resource conservation, and open space preservation became an important campaign issue at all levels of government.



The Montgomery County (PA) Open Space Program helps preserve open space and conserve natural resources. (Photo: http://www.montcopa.org)

In response, county commissioners appointed an Open Space Program Task Force to develop a 10-year program to preserve open space and conserve natural resources. Initial objectives of the program were to provide grants to municipalities and conservation organizations for land acquisition, provide funding for county land acquisition, and develop a county trail system. The program was funded by the county for 10 years with $79 million in general capital funding. To apply for county funds, municipalities were required to write Open Space and Resource Conservation Plans. Financial incentives were provided to encourage municipalities to work together to develop joint plans and acquisition programs. The initial plans spawned many ideas for open space preservation, including municipal bond issues, partnerships, and some joint municipal efforts. All 62 municipalities in the county completed open space plans.

In 2003, the county commissioners appointed a new task force to review the Open Space Program and make recommendations for change. The task force recommended that the Green Fields, Green Towns program be started. Although municipal, conservation organization, and county land acquisition remained the core of the program, grant funding for public landscaping and parkscape improvements was also increased. This program required municipalities to update their Open Space and Resource Conservation Plans. The county financed the program in 2004 by borrowing $60 million, as approved in a $150 million nonbinding referendum in the 2003 general election. The open space referendum was approved by 79 percent of the county voters. In 2010 the county borrowed another $35 million to support the program.

Today, with slowing development and increased expenses, the county tax base has leveled off, and the county has slowed open space borrowing and grants. Since 1993, the county has preserved 7,000 acres of municipal parklands, 4,000 acres of conservation open space, 7,000 acres of working farms, and 43 miles of trails.

Montgomery County Open Space Program: http://www.montcopa.org/?nid=638

Relevant Factsheets

L4 – *The Power of Collaboration in Community Planning* – Discusses the scales of planning and the extent to which collaboration, dialogue, and the planning process itself can influence outcomes.

A1 – *Using Smart Growth Principles to Plan Sustainable Communities* – Discusses the tools of smart growth, including both regulatory and nonregulatory concepts.

N1 – *Developing a Natural Resource Assessment* – Provides an overview of the components of a natural resource assessment to ensure all applicable tools can be used to protect natural resources.

N2 – *Comprehensive Planning for Natural Resource Conservation* – Describes the nonregulatory and regulatory strategies that can be used in comprehensive plans to better protect and conserve natural resources.

N3 – *Regulatory Approaches to Protecting Natural Resources* – Explains in detail the regulatory strategies that can be used in natural resource conservation.

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Changing Landscapes

Land use planning curriculum for natural resource professionals

P rinciples, people, and policies
L and planning and pressures
A pproaches
N atural resource planning tools

N5: Planning for Healthy Forests and Timber Operations

Stewardship requires us to look beyond our immediate personal gain to leave a living legacy for society and future generations.

Overview

States that do not have authorities to regulate forestry activities often use municipal zoning ordinances. If these ordinances are not written properly, they may inadvertently support incorrect forestry operations and techniques. Or, they are simply not complete and lack important provisions. This factsheet provides useful information that can be used to develop high-quality stewardship plans that can then be incorporated into comprehensive plans, zoning, and other land use regulations.

Introduction

Forest stewardship is the wise use of forest resources to ensure forest health and productivity. Sound forest stewardship ensures the long-term management of the environmental processes and economic and social benefits forests provide. Stewardship requires us to look beyond our immediate personal gain to leave a living legacy for society and future generations.

In addition to resource management, forest stewardship brings groups of concerned people together in a collaborative process to address threats to productive forests and solutions. Stewardship involves a social learning and action network of people concerned with the interaction of human and environmental issues.

A forest is more than a collection of trees. It is a dynamic ecosystem, defined by interactions of living organisms and their environment. Forest stewardship challenges us to understand and protect the natural processes that take place in a forest. This is necessary to ensure that when we affect these processes with timber harvests, development, or other actions, we do so in a way that continues to enrich short- and long-term forest health. Because we all use and enjoy wood and paper products, because we all benefit from clean air and water, and because we desire the peace and beauty of our forests, we must work to maintain a balance that allows us to use our forests while ensuring their long-term vitality. If planned for and managed properly, there is no inherent conflict between the economic use of forests and forest stewardship.

Forest Service
Northeastern Area State and Private Forestry
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Newtown Square, PA 19073
October 2014
http://www.na.fs.fed.us

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USDA is an equal opportunity provider and employer.

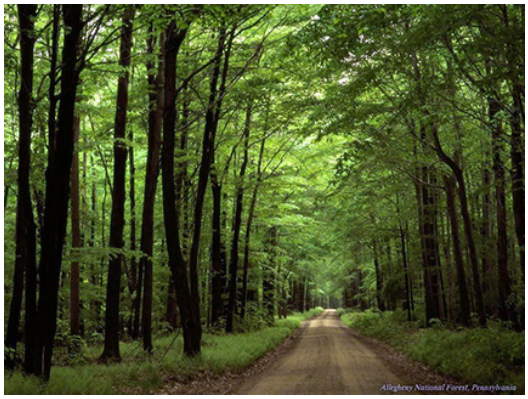
Forest stewardship challenges us to understand and protect the natural processes that take place in a forest.

Forest Stewardship

- Is a component of the more broadly used term "landscape stewardship," which is an inclusive civic process for sharing diverse perspectives and information to promote resource conservation.
- Manages forests for long-term economic, environmental, and social benefits.
- Uses both practical and scientific management approaches.
- Expresses concern and respect for both human and environmental values.
- Provides a conservation focus that brings people together to learn and jointly take action.

Threats to Forest Stewardship

- Climate change
- Fire
- Changing plant communities
- Invasive insects, diseases, and plants
- Conversion of forests to nonforest uses through development
- Economic pressures related to intergenerational transfer of forests
- Growing rural and suburban populations
- Lack of understanding of the environmental, economic, and social benefits forests provide
- Ordinances and regulations that preclude science-based forest management objectives



It is important to have a well-conceived stewardship plan to guide forest management decisions.

Forest and Landscape Stewardship Plans

Many forest owners value their forests but do not adequately understand how to obtain the benefits they want to realize from managing them. Research conducted in Pennsylvania shows that forest landowners are motivated by many factors other than economic gain. Because timber harvesting and other management activities that are completed without proper planning can have undesirable long-term consequences, the importance of having a well-conceived stewardship plan that guides management decisions cannot be understated. By engaging consulting foresters and other natural resource professionals in planning, forest landowners can benefit considerably during timber harvesting and greatly increase the productivity and health of their forests over time.

The first step in developing realistic forest stewardship goals and objectives is to inventory and map forest tracts. Inventory and map all priority resources on the site, including vegetative communities, water resources, soils, slopes, and unique areas with rare species. Use enough detail in the initial inventory to begin developing management objectives. Often a more detailed inventory can be completed later to support more specific timber harvesting and other activities. The inventory and mapping will help direct the development of management objectives during the writing of the stewardship plan. Management objectives often include issues related to improving water quality, reducing invasive plants and ferns, decreasing wildfire risk, and harvesting timber. Include a map that shows the location and size of management units in a stewardship plan as well as a timetable for completing all activities.

Public and private landowners can work together to use their forest stewardship plans to develop larger scale landscape stewardship plans. These plans provide an opportunity for landowners to collaborate on priority resources and actions related to larger scale issues such as wildfire management, forest products, source water protection, wildlife habitat, and insects and diseases that impact forests without regard to land ownership.

Landscape Stewardship

Expanding on the concept of forest stewardship, the U.S. Forest Service released a landscape stewardship guide in 2011. This guide provides a collaboration process that can direct landscape-level stewardship to achieve desired social, economic, and environmental objectives that are shared by stakeholders. Landscape stewardship is an "all lands" approach to forest conservation that works across multiple ownerships through community and landowner engagement to address issues and opportunities. Landscape-level stewardship planning is intended to address broader and more collective goals of many landowners and is not intended to replace a private landowner's site-specific forest stewardship goals and objectives.

Developing a Forest Stewardship Plan

- Seek assistance from a State agency or consulting forester committed to stewardship principles and sound forest management practices.
- Gather information and develop an inventory and map of the property that identifies management units, unit acreage, and objectives. Management units often require different treatments. For instance, pine groves would not receive the same type of treatment as hardwood groves.
- Define objectives related to ownership, use, and management of your land. Think about how you and your family will use the land and the activities you enjoy, and incorporate them into long-term objectives during the stewardship planning process.
- Develop management recommendations and strategies. To achieve objectives, make recommendations clear and practical and discuss what to do, why to do it, and when to do it. Document these objectives in management strategies within your stewardship plan.

Best Management Practices (BMPs)

The growth of individual trees and entire forests can be managed by manipulating the overall structure of the forest. This is done using silvicultural prescriptions and treatments to harvest and regenerate a forest. When done properly, these practices are known as Best Management Practices, or BMPs. Forest management BMPs are widely accepted management activities that can have positive outcomes that minimize negative effects on forest ecosystems when carried out properly. Some BMPs are multipurpose. For example, buffer strips along streams control erosion and sedimentation and also serve as wildlife corridors and aquatic habitat. BMPs provide the basic, minimum acceptable standards of sound forest management, although many landowners often choose to do more.

Forest Stewardship and Timber Harvesting Ordinances

In States that do not have statewide regulations guiding forestry practices, municipal zoning and other ordinances often regulate timber harvesting and other forest stewardship activities. In Pennsylvania, for example, forestry is classified by the State planning code as a land use, such as commercial or residential development, that can be regulated by local municipal zoning ordinances. By contrast, timber harvests in California that exceed certain acreages are regulated by the State forestry department and require state-approved timber harvesting and regeneration plans as well as bonding to ensure regeneration success. Regardless of whether forest land is regulated by municipal or State laws, it is important to incorporate relevant BMPs into ordinances and other policies.

Regardless of how forest land is regulated, it is important to incorporate relevant BMPs into ordinances and other policies.

Often zoning and other municipal ordinances that regulate forestry operations and whose intent is to provide environmental protection can actually discourage the use of valid timber harvesting and regeneration techniques. An example of this is a ban on clearcutting and other even-aged harvesting treatments for forest regeneration that is often found in ordinances. In other instances, local zoning ordinances may be incomplete or lack important provisions that are important to forestry operations. Common omissions include regulations related to logging road design, storage and staging area construction, and clean up requirements. Municipalities must be careful to develop and adopt a forest stewardship ordinance that requires an approved timber harvesting plan based on relevant, high-quality BMPs.

BMPs for Forest Stewardship and Timber Harvesting Ordinances

At the very least, make sure ordinances regulating forestry activities mandate a timber harvest plan that is reviewed and approved by the municipality. Make sure that timber harvesting plans and ordinances include all BMPs that specifically address forest operations and aesthetics.

Forest Stewardship Operations: Regeneration and Renewal

Adequate regeneration of trees and other plants is a primary objective of a properly planned and executed timber harvest. Silvicultural prescriptions such as clearcutting and shelterwood harvesting not only remove trees, but focus on establishing, protecting, and releasing regeneration in the future stand. The goal of harvesting techniques such as clearcutting is forest regeneration and renewal rather than the often mistaken assumption that harvesting will have a negative impact on regeneration.

Having adequate tree regeneration is a primary objective of a properly planned and executed timber harvest. (Photo: Arlyn Perkey, U.S. Forest Service (retired))

In many Eastern States, forest regeneration depends on the natural recruitment of seedlings, seed sources, and root and stump sprouting. Conduct a preharvesting assessment of existing seedlings and seed sources to better understand and plan for regeneration. White-tailed deer have broad impacts on forest plant communities and can reduce or even eliminate certain type of tree seedlings such as oak, maple, and ash. Forests with an overabundance of deer often require special considerations such as fencing or hunting to protect seedlings so that adequate regeneration can occur naturally.

Forest Regeneration and Renewal BMPs

Determine which harvesting techniques will be used, such as clearcutting or selection cutting, after thoroughly considering the amount of sunlight and other biological needs of the tree species targeted for regeneration. Some trees, such as cherry, need more sunlight to regenerate and grow. Not providing enough light can reduce the number of black cherry, white ash, hickory, yellow-poplar, and northern red oak seedlings.

Assess the ability of existing tree seedlings, seed sources, and potential stump and root sprouts to grow following the cutting. Assess and, if necessary, control competing vegetation such as ferns, grasses, and other undesirable understory plants to minimize competition. Common plants that compete with tree regeneration and growth include hay-scented and other rhizomatous ferns, grasses, striped maple, American beech, mountain laurel, ironwood, and musclewood. Herbicides are often used to control competing vegetation. If properly prescribed and applied, their use can provide effective control with low risk to people.

Forest Operations: Protecting the Residual Stand, Site Quality, and Productivity

Careless cutting and removal of trees and equipment often compacts the soil and damages tree canopies, trunks, and the roots of seedlings and other desirable trees. This damage can have long-term consequences that reduce site quality and result in poor tree form.

Protecting the Residual Stand, Site Quality, and Productivity BMPs

Avoid high grading, diameter limit cuts, or other selection harvests that reduce species diversity, leave poor-quality trees, and negatively impact regeneration. From an economic perspective, a diameter-limit cut takes the most profitable trees and leaves the rest. Such a cut removes the fastest growing individuals, which are often economically the most valuable, and leaves lower valued trees. Although this kind of harvest provides a profit, this technique lowers the ability of a forest to provide economic and environmental benefits in the future. When looking at net present value and other economic analysis, some economists insist that diameter-limit cuts actually reduce the ability of landowners to realize a longer-term profit from the timber in their forests. Clearcut, shelterwood, or seed tree harvests usually provide optimal economic and environmental benefits in eastern forests.

When planning a harvest, loggers, contractors, and landowners must understand the importance of protecting soils and using care not to damage desired trees. Take care when applying stand thinning operations to avoid opening the forest up to too much sunlight that encourages the establishment of vegetation that competes with regeneration. Use topographic maps and soil surveys to design and lay out skid trails, roads, and log landing areas. Keep the footprints of storage areas and road networks as small as possible. Use waterbars and other erosion control structures on skid trails and roads to remove surface water. Take care not to contaminate soils with fuels, lubricants, or other materials. Avoid working on soils saturated with water from heavy rains or snow melt. Minimize soil compaction by matching equipment operation with soil types and moisture levels. Mark and protect unique vegetation or areas to be protected before logging activities begin.

Supporting Forest Stewardship and Productive Forests

- Use proper BMPs in planning and management.
- Reward landowners for managing and retaining their lands by developing new markets for ecosystem services such as carbon sequestration.
- Develop State and local land use policies that reduce forest fragmentation.
- Develop State and local policies that promote conservation and the protection of natural resources.
- Promote diverse forest product markets that provide opportunities for alternative products such as biomass.
- Support tax, inheritance, and other policies that protect productive forests from development.
- Facilitate planning and management partnerships at watershed, ecosystem, or larger meaningful scales.

It is important to use care not to damage trees during timber harvesting. (Photo: J.P. Barsky, The Connecticut Agricultural Experiment Station)

When planning a timber harvest, loggers, contractors, and landowners must understand the importance of protecting soils and using care not to damage desired trees.

Forest Stewardship Operations: Water Quality

Using proper forest operations can protect water quality by reducing soil erosion, protecting existing vegetation, and buffering harvesting activities that can contribute sediments to nearby streams and water bodies.

Water Quality BMPs

Comply with all State laws regarding erosion, sedimentation, road design, stream crossings, cross-drain culverts, and other features. Provide adequate riparian buffers between roads and streams. Use properly constructed bridges and culverts to cross streams. Design roads and landings to prevent or slow and divert surface water flows. Avoid locating roads and landings on seasonally wet soils and, if possible, avoid steep slopes when laying out roads and landings. Cross wetlands only when absolutely necessary. If it is necessary to take heavy equipment into wetlands or onto saturated soils, do so during the driest periods or when the area is solidly frozen. Do not skid logs through water courses or springs. Grade and seed the road network at the completion of operations.

The forest riparian buffer along this small tributary to the Chesapeake Bay reduces sediment and nutrient runoff from adjacent farmland. (Photo: Ben Longstaff, IAN Image Library http://ian.umces.edu/imagelibrary/)

Insect, Disease, and Fire BMPs

Take appropriate control measures if there is the likelihood that insects, disease, or fire may threaten your forest. Use harvesting and regeneration strategies that increase species diversity and stand composition to make forests more resilient to these problems.

Forest Stewardship Operations: Insects, Disease, and Fire

Insects, disease, and fire can kill trees and devalue those that survive. Consider specific management objectives for each of these threats. Each can be minimized by using BMPs specific to pre- and post-harvesting activities. State service foresters can provide information and assistance for insect, disease, and fire-related issues.

Consider specific management objectives for threats from insects, disease, and fire.

Hiring a Consulting Forester

A forestry or resource consultant is a professionally trained individual who can help plan and carry out science-based forest management practices. Make sure the forestry consultant understands your short- and long-term objectives. It is important that a professional forester represents your interests because a poorly planned harvest can be long lasting and have severe economic and ecological consequences. Consider if the forestry consultant 1) shares your values about the land, 2) has the capacity to develop a prescription that embraces your values, 3) has a commitment to sustainable forestry, and 4) has an affiliation with a professional group that represents the forest industry.

Using Stewardship to Protect Forest Aesthetics

Much of the public opposition to timber harvesting and other forest management activities is due to the fact that the site looks different. The public is more accepting of the change if a harvested forest does not look degraded and "appears" to be functioning well.

Forest Aesthetics BMPs

BMPs that protect forest aesthetics can be a powerful component of a forest stewardship ordinance. Forest aesthetics BMPs can ensure that forests appear to be intact, healthy, and cared for during and after forest operations. Sound forest aesthetic BMPs that improve public perceptions include:

- Leaving a visual buffer (forested area left relatively undisturbed to lessen the visual or environmental impacts of timber harvesting) between forestry activities and roads, streams, homes, businesses, and important views.
- Removing broken, leaning, and badly scarred trees.
- Locating landing areas away from public view.
- Protecting rare and important plant species.
- Cutting up harvested tree tops and limbs near public roads, trails, or recreation areas.
- Removing trash daily.
- Grading and seeding landing areas when the operation has ended.
- Keeping mud off public roads.
- Minimizing runoff that can contribute sediment to waterways and water bodies.

Best Management Practices that protect forest aesthetics can be a powerful component of a forest stewardship ordinance.

Forest Stewardship: Important Definitions

Basal area (BA)
The cross-sectional area of a tree trunk in square feet measured at 4½ feet above the ground. Basal area per acre is calculated as the sum of the basal areas of individual trees.

Board foot
A unit of wood 1 inch thick, 12 inches long, and 12 inches wide or a board containing 144 cubic inches.

Buffer strips
Forested areas left relatively undisturbed to lessen the visual or environmental impacts of timber harvesting.

Clearcutting
An even-aged harvesting and regeneration prescription that removes all trees, regardless of size, in an area in one cutting. It is often appropriately used with species like cherry and tulip popular that require full sun to reproduce and grow or to create specific early successional habitat for wildlife.

Crown class
A classification of an individual tree based on its crown's position in the overall forest canopy and the amount of sunlight it receives. Recognized categories include dominant, codominant, intermediate, and suppressed.

Diameter at breast height (d.b.h.)
The diameter of a tree measured at 4½ feet above ground level.

Diameter-limit cut
A timber harvesting treatment in which all trees over a specific diameter may be cut, often resulting in high grading. Along with negatively affecting forest health, diameter-limit cuts can reduce future economic gains by reducing the amount of high-quality timber that would have resulted from longer-term sound management.

Even-aged stand
A group of trees that do not differ in age by more than 10 to 20 years.

High grading
A type of timber harvesting where larger trees of commercially valuable species are removed with little regard for the quality, quantity, distribution, or regeneration left on the site.

Regeneration cut
A timber harvest designed to promote the natural regrowth of trees. Even-aged stands are perpetuated by three types of regeneration cuts: seed tree, shelterwood, and clearcutting. Uneven-aged stands are perpetuated by selection cutting that removes selected individual trees in all diameter classes, from small to large, or small groups of trees.

Seed tree cut
A regeneration cut where mature trees are left standing in a harvested area to provide seeds for regeneration of the cut-over site.

Shelterwood
A regeneration cut that supports reproduction by removing all overstory trees in a series of cuts over years. This gradual reduction of stand density and canopy protects understory trees, limits light for invasive species, and provides a seed source for stand regeneration.

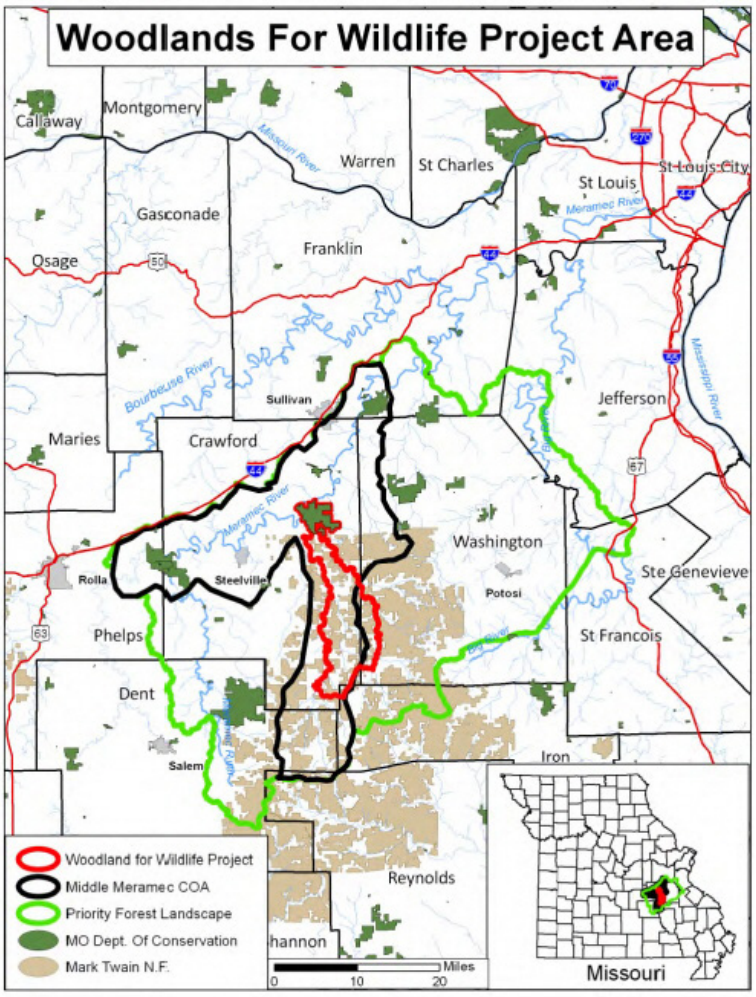
Thinning or intermediate treatment
A removal of some trees to encourage the growth of other trees that are left behind (residual trees). Residual trees may be selected based on species and age. A thinning may be classified as commercial if the removed trees have commercial value or as precommercial if smaller, less valuable trees are removed.

Uneven-aged stand
A group of trees made up of three or more age classes growing together on a site.

Case Study — Shoal Creek Landscape Stewardship Conservation Marketing Plan

The vision of the Shoal Creek project was "…to improve the native plant and animal communities of public and private lands now and in the future." It included objectives related to riparian areas and improving and restoring woodlands and glades, removing invasive species, and sharing forestry information and management assistance with landowners.

Missouri's 70,000-acre Shoal Creek Woodlands for Wildlife project faced a number of resource management challenges and opportunities—a patchwork of private, Federal, and State ownerships; the likelihood of residential development; overstocked forests; and degraded animal and song bird habitats. In addition, there was a significant need and opportunity to communicate the importance of maintaining and improving riparian corridor habitat conditions to landowners.



Missouri's Shoal Creek Woodlands for Wildlife project map. (Map: Woodlands for Wildlife: A Natural Resource Stewardship Action Plan. Middle Meramec Conservation Opportunity Area Partnership)

The Shoal Creek project developed a conservation marketing process. Conservation marketing is a planning, communication, and implementation process that delivers desired products and services to targeted customers. In this project, this process was used to benefit the environmental and socioeconomic needs of the landowners. First, the Shoal Creek project developed shared stewardship goals, objectives, and strategies. Then other marketing plan elements were developed that included 1) defining and profiling the socioeconomic conditions, including political cultures, attitudes, employment, industry, and land development potential; 2) clarifying the program's messages for landowners, business, and others; 3) developing a marketing strategy that used cost-share grants, partnerships, and education to disseminate information; and 4) evaluating change.

Within approximately one year, a landowner's committee was established to identify priority natural resource issues. Priority issues included reducing streambank erosion, increasing timber harvest education and assistance, and improving fish and wildlife habitat. Work continues to blend these shared issues into a landscape stewardship action plan that engages resource professionals to work with landowners.

Relevant Factsheets

P5 – *Principles of Ecosystem Services* – Strong forest stewardship standards ensure that ecosystem processes and the services they provide are protected.

A3 – *Managing Stormwater with Green Infrastructure* – Forests of all sizes slow surface water and are recognized as an integral component of green infrastructure solutions to stormwater management.

N2 – *Comprehensive Planning for Natural Resource Conservation* – Municipal comprehensive plans can address forest stewardship.

N3 – *Regulatory Approaches to Protecting Natural Resources* – Best Management Practices (BMPs) related to forestry and timbering activities are enforceable components of forestry ordinances.

N4 – *Nonregulatory Approaches to Natural Resource Conservation* – Long-term planning for the intergenerational transfer of private property and the provision of tax and other incentives help conserve privately owned forest properties.

N6 – *Planning Tools to Protect Water Quality* – Many forest stewardship BMPs protect water quality and address the management of surface water flow during timbering activities.

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Land use planning curriculum for natural resource professionals

P rinciples, people, and policies
L and planning and pressures
A pproaches
N atural resource planning tools

N6: Planning Tools to Protect Water Quality

Protecting water quality is important because life depends on clean water to survive. (Photo: Joseph O'Brien, U.S. Forest Service)

Overview

As stormwater runoff increases, many communities face flooding, damage to infrastructure, degraded aquatic and terrestrial ecosystems, and greater numbers of invasive species. This factsheet provides an overview of the threats to water resources, water regulations, and the importance of healthy ecosystems—especially forest systems—to water quality. It also provides examples of planning tools that can help mitigate the threats and protect those natural resources that support water quality.

Importance of Protecting Water Quality

Protecting water quality is important because life depends on clean water to survive. The ability of freshwater systems to efficiently recycle and remain healthy determines the usability of water for people (Naiman and others 1995). The average American most likely thinks of water quality in terms of safe drinking water and "fishable" and "swimmable" streams and lakes. However, the public is increasingly aware of the impacts that changes in land use have on water resources.

Most people think of water quality in terms of safe drinking water and "fishable" and "swimmable" streams and lakes.

Land development decisions directly impact water quality because these decisions change the natural systems that support water systems. Development impacts are often the greatest on small headwater streams that make up 80 percent of the Nation's stream network with 75 percent of these being first- and second-order streams.

In the past, water quantity (flooding) issues were often solved without regard for water quality. Today it is essential to consider both water quantity and quality, in part to be able to obtain necessary permits. Traditional stormwater practices, such as using pipes and concrete flumes, focus on solving water quantity issues on a given site by removing water as quickly as possible. Unfortunately, this strategy often has negative effects downstream,

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including flash flooding in receiving waters and decreased water quality because of the runoff of oil and other contaminants.

Current trends in stormwater management are designed to solve water quantity issues on a given site while also improving water quality. These trends are commonly referred to as Stormwater Best Management Practices (BMPs). They include protecting existing streams and water bodies, constructing "green" infrastructure, and monitoring water quality.

Traditional stormwater practices often have negative effects downstream, including flash flooding and decreased water quality. (Photo: FEMA/David Fine)

Water Quality Protection Regulations

The United States has a long history of legislation to protect and improve water quality. The laws listed here have shaped water protection regulation and led to the water protection practices in place today.

Drinking Water Legislation

Almost any legislation directed at water has an impact on drinking water. The 1996 amendments to the Safe Drinking Water Act gave States greater flexibility and responsibility for administering drinking water programs.

Clean Water Act (1972)

The Clean Water Act is the primary water quality law today. It defines EPA's responsibilities for restoring and maintaining the chemical, physical, and biological integrity of the waters of the United States so that they can support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water." States carry out this law through a variety of programs designed to prevent point and nonpoint pollution sources, help with publicly owned water treatment works, and maintain the integrity of wetlands.

Secure Water Act (2009)

This act provides authority for Federal water and science agencies to work with State and local water managers to plan for climate change and other threats to United States water supplies as well as take action to secure water resources for the communities, economies, and ecosystems they support.

Water Quality Act (1987)

This act requires a National Pollutant Discharge Elimination System permit for sources of nonpoint pollution such as construction sites and industrial nonpoint discharges.

The My Clean Water Act national program was created in 2012 to celebrate the 40-year anniversary of the signing of the Clean Water Act. (Logo: My Clean Water Act Program)

Safe Drinking Water Act (1974)

This act defines the Environmental Protection Agency's responsibility for setting national health-based standards for drinking water quality and overseeing the States, localities, and private water suppliers who adhere to those standards.

Weeks Act (1911)

This act authorized the Federal purchase of forest lands in the headwaters of navigable streams, established the National Forest Reservation Commission, gave consent for States to enter into compacts to conserve forests and water supplies, and authorized Federal matching funds for approved State agencies to protect forested watersheds or navigable streams.

Forest Service Organic Administration Act (1897)

Although this law was established primarily for forest improvement and protection, this law explicitly states doing so "…to secure favorable conditions of water flows."

The Weeks Act authorized Federal purchase of forest lands in the headwaters of navigable streams.

Planning Tools for Watershed Management

There are a variety of tools to help planners protect valuable water resources during the planning process.

Land Use Plan

Municipal governments can use a land use plan to guide development proposals in their communities. Planners evaluate available data regarding land and water sensitivity, economic conditions, and social environment to develop a land use plan. This tool's effectiveness varies among communities. Plans are updated routinely, typically every 5 to 10 years.

Natural Resource Inventory

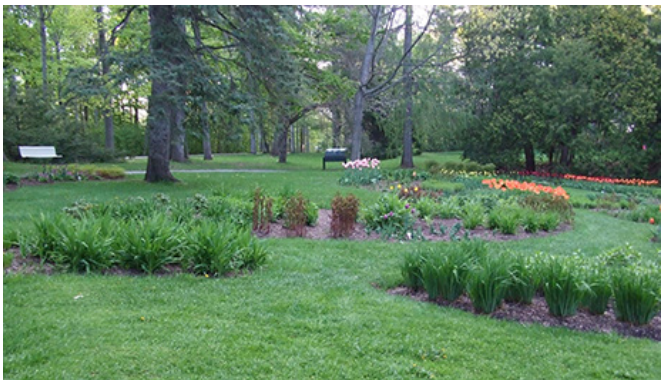
This tool is a series of map overlays that delineate sensitive natural resource areas and less sensitive areas. It is typically developed by natural resource professionals using aerial photography analyses, remote sensing data, and field reconnaissance. This tool gives municipal decisionmakers information that helps them develop land use plans and review development plans under a simple premise: you need to know what you have before you can work to save it.

You need to know what you have before you can work to save it.

Aquatic buffers in the form of healthy forests provide critical protection for water resources while also providing habitats for wildlife and recreational opportunities for people.

Land Conservation

State and local governments frequently manage conservation areas to protect their natural resources and for the recreational amenities they provide. Some municipalities require a conservation easement or parkland dedication from developers to set aside permanent open space as part of their development permit requirements. The Natural Resources Conservation Service manages land conservation incentive programs at the county level. Many States and municipalities also offer voluntary landowner assistance programs that promote natural resource conservation on private land.



Some municipalities require developers to set aside permanent open space as part of their development.

Groundwater Protection Requirements

Most of the environmental laws in place to protect natural resources also have the dual benefit of protecting groundwater from contamination. For example, the Resource Conservation and Recovery Act, which regulates the storage, transportation, and disposal of solid and hazardous wastes, also helps prevent contaminants from leaching into the groundwater from landfills, underground storage tanks, and other sources.

A provision within the Safe Drinking Water Act established the Wellhead Protection Program. This law requires that States develop a comprehensive program to protect public water supply wells from contaminants that could be harmful to human health. This is achieved partially through protecting all or part of the land surrounding a well from which groundwater is drawn.

Nonstormwater Discharge Regulations

Under the National Pollutant Discharge Elimination System (NPDES) program authorized under the Clean Water Act, all facilities that discharge pollutants from any point source into waters of the United States are required to obtain a permit. This includes introducing nonstormwater into storm drainage systems, such as wash water from laundry facilities.

Under Section 303 (d) of the Clean Water Act, communities are required to develop lists of impaired waters, establish priority rankings for these waters, and develop Total Maximum Daily Loads.

Watershed Protection and Restoration

Many recent efforts towards managing urban forests for watershed health have resulted in a variety of highly useful tools and training materials. The Center for Watershed Protection has developed an approach to watershed management that considers all stages in the land development process from land use planning through land development and post occupancy.

Watershed Stewardship

There are many nonprofit stewardship groups that work to monitor and improve the quality of streams and water bodies in their watershed. These organizations frequently form partnerships with local government to advance water quality education and cleanup efforts in their communities.

Many nonprofit groups work to improve the quality of streams in their watershed.

Aquatic Buffers

Aquatic buffers help municipalities restrict or prohibit development within a designated zone around wetlands, streams, and water bodies. In addition to protecting aquatic resources from disturbance, aquatic buffers (especially healthy forest buffers) provide areas for stormwater infiltration, wildlife habitat, and recreational amenities in the form of trails and greenways.

Better Site Design

Municipal codes and ordinances have a strong influence on site design. Requirements for building setbacks, the number of parking spaces, and landscape design ultimately impact the quality and quantity of water that the site generates. Many municipalities are amending their codes and ordinances to favor sustainable site development practices and, in some cases, to require their use.

Erosion and Sediment Control Requirements

This group of tools allows States to ensure that erosion and sediment are being controlled on development sites. EPA NPDES Construction General Permits are required when developers plan to disturb sites larger than one acre or plan to develop an area that will eventually disturb more than one acre through additional phases. As part of the permitting process, the developer is required to prepare a Stormwater Pollution Prevention Plan, which must be followed throughout the construction process.

Stormwater Best Management Practices (BMPs)

BMPs are site-specific improvements designed to catch and treat stormwater runoff at the source by either reusing it on site or having it infiltrate into the ground. Many States encourage this group of stormwater management techniques as part of the requirements to obtain an NPDES permit. In addition, many municipalities have ordinances that require the use of BMPs.

One type of stormwater BMP is constructing wetlands to store stormwater and remove pollutants.
(Photo: Wisconsin DNR/Pete Wood)

Water Quality Management

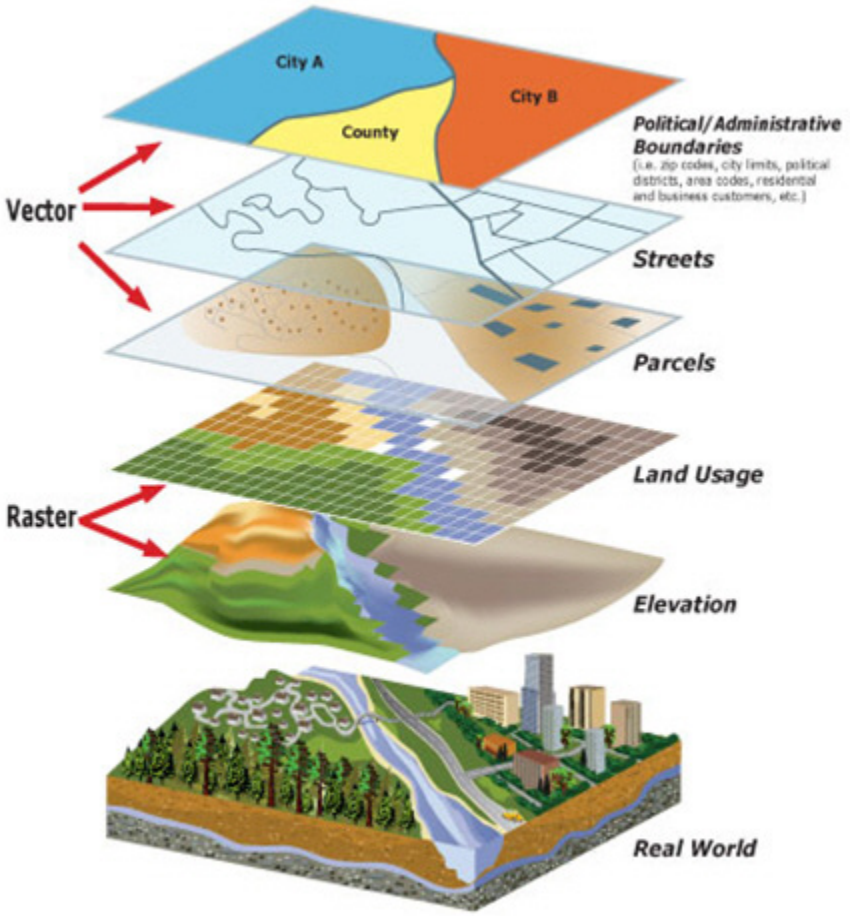
The goal of the WaterSMART program established under the Secure Water Act of 2009 is to achieve sustainable water conservation, recycling, and reuse strategies. The program includes numerous partnerships, incentives, assessments, grant programs, and best practices for carrying out water conservation and recycling efforts.

Technical Tools and Databases

There are a number of technical tools and databases that planners use to support planning decisions and activities. New technical tools are frequently being introduced that use emerging technology.

Geographic Information System (GIS) Mapping and Modeling

A GIS integrates hardware, software, and data to capture, manage, analyze, and display all forms of geographically referenced information. Digital map layers are available online at many scales from the national level to the local level, depending on the location. The U.S. Geological Survey (USGS) and the Natural Resources Conservation Service have multiple GIS maps and data layers available for use in planning.



Geographic information systems use overlapping digital map layers to help users analyze data. (Illustration: Birmingham, AL, National Weather Service GIS Data Page)

Water Budgeting

This method examines the impacts of land use on a given water body or watershed by measuring inputs and outputs of water to and from the soil profile. Water budget details are developed locally for a given water body or watershed. The Ecological Limits of Hydrologic Alteration tool integrates environmental water flows of individual watersheds into regional water resource planning and management, and estimates environmental water flows across large regions.

Databases

There are numerous databases that have been and are being developed to provide information about natural resources for multiple purposes. EPA's Watershed Assessment, Tracking and Environmental Results System (WATERS) is an integrated information system for the Nation's surface waters. The WATERS database connects the information from individual water programs into a framework that is a digital network of surface water features known as the National Hydrology Dataset, which effectively shares information across programs. The Forest Service developed another database that provides condition classifications for watersheds on National Forest System lands. For more information, go to http://www.fs.fed.us/publications/watershed/.

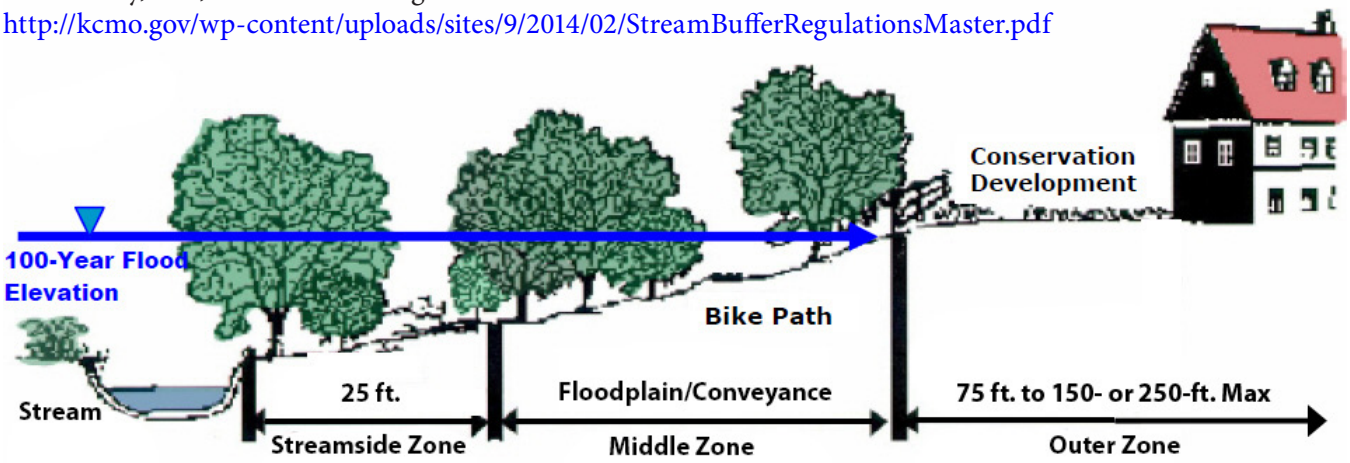
Resource Assessments

Water quality can be measured using a number of techniques that include surveying the flora and fauna present and chemical testing. The USGS National Water Quality Assessment (NAWQA) Program assesses regional and national water resources to provide an understanding of water quality conditions, and how natural features and human activities affect those conditions. Planners at a variety of levels use the NAWQA information to design and carry out strategies to manage, protect, and monitor water quality.

Case Study — Kansas City, Missouri (KCMO) Stream Setback Ordinance

This model ordinance illustrates the integration of humans and ecological processes to protect water quality. Developers of the ordinance used an ecosystem approach, which effectively balanced environmental, economic, and social factors. This ordinance provides multiple community benefits, from stormwater management to recreation and wildlife habitat, while minimizing the impact on developable land. Through this ordinance, KCMO will be able to conserve functional riparian forest buffers, improve water quality, and provide habitats for wildlife and recreational opportunities for people.

Kansas City, MO, Stream Buffer Regulations:
http://kcmo.gov/wp-content/uploads/sites/9/2014/02/StreamBufferRegulationsMaster.pdf



The Kansas City, MO, stream setback ordinance uses a three-tier riparian buffer system. (Illustration: Laurie Brown, Vireo)

Case Study — Chesapeake Bay Total Maximum Daily Load (TMDL)

On December 29, 2010, the U.S. Environmental Protection Agency established TMDLs for the Chesapeake Bay. This historic and comprehensive "pollution diet" calls for rigorous accountability in an effort to initiate sweeping actions to restore clean water in the Chesapeake Bay and the region's streams, creeks, and rivers. Actions taken using the TMDL standard will also have significant benefits far beyond the Chesapeake itself—clean rivers and other waterways that not only support local economies and recreational pursuits such as fishing and swimming but serve as drinking water sources as well.

U.S. EPA Mid-Atlantic Water:
http://www.epa.gov/chesapeakebaytmdl/

Map of the Chesapeake Bay region. (Web site: http://www.epa.gov/chesapeakebaytmdl/)

Relevant Factsheets

P2 – *Policies that Direct Natural Resource Planning* – Provides the foundation for regulations that direct water protection and use.

P5 – *Principles of Ecosystem Services* – Discusses the value of ecosystem services provided by natural resources such as water.

L3 – *How Planning is Put into Practice* – Proper planning can greatly minimize costs associated with protecting water quality.

A3 – *Managing Stormwater with Green Infrastructure* – How stormwater is managed directly impacts streams, lakes, and other water bodies, including their stability and water quality.

A4 – *Using Science to Substantiate Natural Resource Planning* – Provides the scientific resources for defining water quality and impacts.

N1 – *Developing a Natural Resource Assessment* – Provides tools for assessing water resources in the field.

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N7: Minimizing Parcelization, Fragmentation, and Sprawl

There are a number of practices and planning approaches that contribute to the unchecked expansion of suburbia. (Photo: Ryan Hagerty, U.S. Fish and Wildlife Service)

Overview

No single action creates sprawl, parcelization, and fragmentation. There are, however, a number of practices and planning approaches that contribute to the unchecked expansion of suburbia and resulting ecological consequences. This factsheet discusses some of the public and private land use practices that have contributed to parcelization, fragmentation, and sprawl development and familiarizes readers with tools that are being used to address it.

Sprawl

Sprawl is a disorderly pattern of lower density land development that spreads out from urban and village centers along highways and into the rural countryside. It converts large tracts of open space, farmland, and forests into smaller parcels of disconnected, developed land that no longer serve their traditional roles or natural function. A typical characteristic of sprawl is its dependence on the automobile and lack of pedestrian connectivity. Sprawl is most recognizable as strip development along major roads; isolated, large-lot subdivisions in rural areas; unconnected suburban office parks; and shopping malls with expansive parking lots.

Parcelization

Parcelization is the division of larger tracts of land into smaller parcels under different ownerships. It usually involves the conversion of working land to private, nonindustrial ownership. Most industrial and public landowners are committed to sustaining a variety of natural resource values, including forest productivity, biodiversity, and recreation. Parcelization occurs when developers purchase and subdivide large tracts of land and then sell individual lots for residential development at a profit. Conversion of larger tracts of land to smaller, random, or irregular parcels occurs gradually over time as land passes from one owner to the next and is further subdivided.

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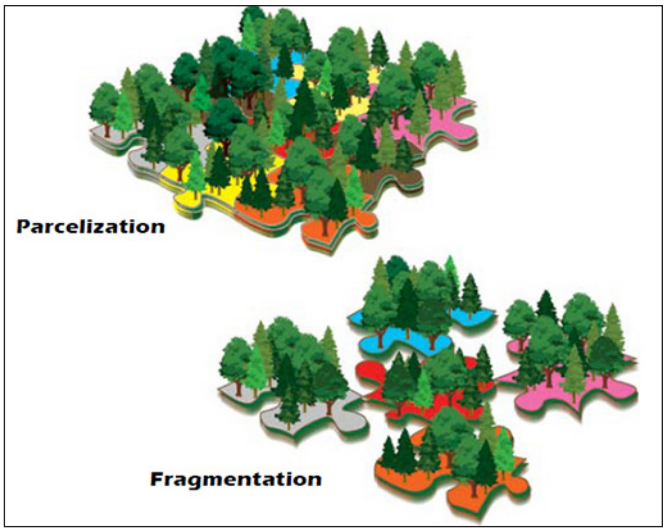
Fragmentation

Fragmentation is the process by which large, contiguous blocks of naturally functioning land are divided into smaller parcels. Forests and open land that once provided contiguous habitat become small islands isolated from each other. This negatively affects the ability of plant and animal species to persist in the fragmented landscape as they lose vital connections to shelter, food, and even other species needed to replenish the gene pool. Parcelization is a main contributor to fragmentation, although there are a variety of human actions that contribute to it as well. These include the construction of roads, pipelines, and rights-of-way for utilities.



Parcelization is the division of larger tracts of land into smaller parcels under different owners. Fragmentation is the division of large, contiguous blocks of land into smaller parcels that are no longer connected. (Illustration: http://na.fs.fed.us/pubs/misc/snap_shot/ss.pdf)

Conversion

Conversion of forested and other natural landscapes to commercial and residential use is increasingly affecting the provision of ecosystem services to people. This is particularly true for private rural lands in the United States. Predicted increases in population growth and associated development will most likely result in a reduction of goods and services derived from both public and privately owned forests (Small and Lewis 2009).

Impacts of Sprawl

Sprawl separates the places that people live from where they work, shop, and recreate. It can also segregate different groups of people from each other (i.e. young, elderly, wealthy, poor). For example, subdivisions on the fringe of cities and in the rural countryside are not readily affordable to low-income families. Essential services such as schools and hospitals tend to be located far from housing, which increases auto dependency and expands the road network. Workers have longer commutes, spend more time in traffic, and have less time at home or being involved in community activities. This lack of engagement in community can have detrimental impacts on community character, sense of place, and civic pride.

Sprawl separates the places that people live from where they work, shop, and recreate. (Photo: The Center for Rural Massachusetts, University of Massachusetts–Amherst)

Increased development density associated with sprawl can force a community's limited resources to be allocated to maintaining and improving roads, water, and sewer facilities built for new development. Critical tax revenue is lost as people move into newly developed areas and away from established cities and neighborhoods where infrastructure already exists.

Sprawl leads to the loss of public access and recreational opportunities. Ownership changes can cut off recreational access to community amenities because new landownership prevents access to or across land. Sprawl also impacts scenic views and access to cultural and historic features in the landscape, reducing the value of the landscape experience and the economic impacts that come with it.

Sprawl also has great environmental impacts. Perhaps the most significant impact is loss of biodiversity due to the division and destruction of critical habitat. It increases predation and mortality and decreases species populations, particularly for wide-ranging species such as bears and mountain lions. Loss of contiguous forests and open space puts great pressure on the functioning of ecological systems within smaller tracts of land. It provides opportunities for exotic plants, insects, and diseases to be introduced and further harm native species, thus adding additional stress to already compromised ecosystems. Changes in forest size, forest edge, plant species composition, and health increase fire risks.

Sprawl has great environmental impacts. Perhaps the most significant impact is loss of biodiversity due to the division and destruction of critical habitat.

Factors that encourage sprawl, parcelization, and fragmentation include:

- Increasing populations and cultural and demographic shifts
- Greater availability of large tracts of land for development due to economic downturns
- Changes in consumer trends and market forces
- Expansion of interstate highway and roadway systems
- Expansion of water, sewer, and utility infrastructure
- Economic policies, local taxation, and land use regulation that favors land conversion and development

Rationale for Smart Growth

Smart growth is a widely accepted planning and design solution to sprawl. Advocates of smart growth emerged nearly 20 years ago and have helped codify the concept in Federal and State planning policy. Many communities have adopted smart growth principles into zoning, stormwater, and other land use regulations.

Smart growth implies a sustainable approach to development. It supports local economies, protects the environment, promotes social equity, and increases quality of life. The 10 principles of smart growth encourage developing existing open lots and compact development density, which help reduce the impacts of sprawl. Each principle promotes design that manages growth; protects open space; creates tangible environmental improvements; and offers choices in housing, transportation, shopping, recreation, and jobs while stimulating economic growth and preserving community quality of life. Communities can use a variety of regulatory tools to carry out the principles of smart growth, which are described in the following section.

Tools for Minimizing Parcelization, Fragmentation, and Sprawl

Although Federal and State governments provide communities with the authority to regulate land use through enabling legislation, the most important decisions about growth and development take place at the local level. Local governments create plans, establish ordinances that define where and how development occurs, and issue permits for residential and commercial construction. As such, it is important that local governments use tools that will help their community grow in a sustainable and ecologically sensitive manner. There are a variety of strategies, ordinances, programs, and policy tools that local governments can use to translate smart growth principles into action to limit or control sprawl.

The most important decisions about growth and development take place at the local level.

Cluster Subdivision (or Conservation Subdivision)

Cluster subdivision is a type of land subdivision that clusters groups of homes on small lots to permanently protect open space and valuable land. The portion of the parcel that is not developed can be restricted by a conservation easement, owned by the homeowner association or some other entity, or used for common space. Ownership by a homeowner association often limits public access. Many municipalities use cluster subdivision and public ownership in an accessible and planned open space system.

Cluster Subdivision Benefits

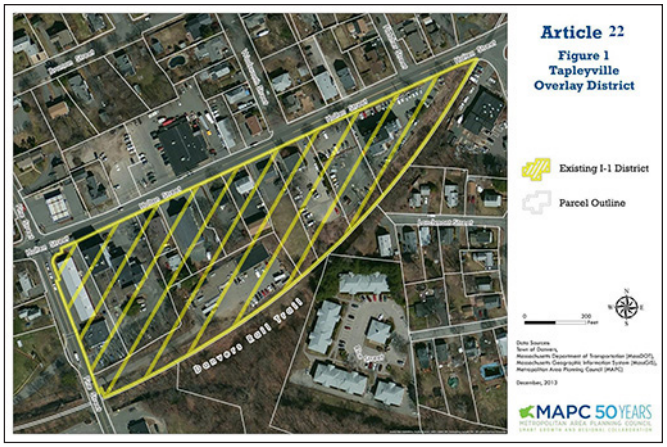
- Encourages creative and flexible site design that is sensitive to the land's natural features and adapts to the natural topography.
- Encourages the preservation of a property's natural assets, including existing vegetation.
- Avoids placing development in areas subject to environmental constraints and hazards.
- Maintains larger blocks of land that preserve ecological values.
- Preserves the visual quality of agricultural, forested, and rural areas in the landscape.
- Reduces the cost of installing and maintaining infrastructure by reducing the distance that utilities, such as water and sewer lines, need to be extended.

Impact Fees

To meet the challenge of funding new services and accommodating infrastructure demands from a new development, the State can authorize municipalities to charge developers a one-time fee to offset the cost of expanding services for the new development. Impact fees are typically spent on capital improvements that are not within the development's boundaries but are impacted by the development. They can be wide-ranging and extended to any municipal capital expenditure required to meet the needs of population growth caused by the new development, including the development of needed parks, schools, roads, sewer, water treatment plants, utilities, libraries, and public buildings. The fee cannot be used to cover normal operation and maintenance or personnel costs. Impact fees are illegal in some States such as Pennsylvania.

Overlay Districts

Adopted as part of a zoning bylaw, overlay districts are land use districts superimposed over one or more basic zoning districts. Overlay districts alert developers to issues and additional requirements they need to address when applying for development permits. Overlay districts establish development restrictions or extend development incentives on properties within a defined geographic area or on land characterized by specific physical features or site conditions (i.e. steep slopes, wetlands, and riparian areas). They are intended to discourage development in unsuitable areas and protect certain critical features and resources (i.e. wildlife, floodplains, and rare species agriculture, among others).



Overlay districts are land use districts superimposed over one or more basic zoning districts. (Photo: http://planning101.mapc.org/2014/02/danvers-town-meeting-unanimously-passes-tapleyville-overlay-district-article/)

Planned Unit or Planned Residential Development Ordinances

Planned unit development (PUD) regulations can be provided through an amendment to subdivision and land development ordinances as an alternative to conventional, single-lot subdivision. PUD ordinances allow developers to plan a large development parcel as a single entity, but provide flexibility, creativity, and innovation in the planning and design. PUDs encourage a mix of uses, housing types, and densities, such as those found in traditional town and village centers, new town centers, and other designated growth centers. They also require a large amount of open space preservation—up to 50 percent of the parcel. Because developers can customize the project to the specific land under consideration, environmental disturbance can be minimized and important natural features can be protected.

Conditional (Special) Use Permits

Conditional use permits allow local governments to consider land uses that may be essential or desirable to a particular community, but that are not allowed as a matter of right within a zoning district. Communities may also use conditional use permits to control certain uses that could have detrimental effects on the community. Conditional use permits require a public hearing and extra conditions that a developer must satisfy to build a project. They often require the approval of elected officials. Many communities find that a conditional use permit is a flexible regulatory tool for accomplishing a variety of community land use goals. A conditional use permit can also ensure that certain uses do not adversely impact important community resources such as public facilities, road capacity, parking, steep slope development, and community character.

Adequate Public Facilities Ordinance

An adequate public facilities ordinance ties development approvals to the availability and adequacy of public facilities such as roads, sewer systems, schools , water supply, and public safety. A community must define and adopt the levels of service or system capacity to be maintained prior to issuing a permit. The application of this kind of ordinance must also be tied to a funding source (capital budget or capital improvement program) that seeks to plan for or remedy the problems associated with growth. If a proposed development cannot be supported within the existing capacity, the developer must either pay for or build the required infrastructure, or wait until adequate facilities become available. Adequate public facilities ordinances help communities guide growth in a proactive manner that can prevent sprawl, parcelization, and fragmentation. To see Maryland's model guidelines for such an ordinance, go to http://www.mdp.state.md.us/PDF/OurProducts/Publications/ModelsGuidelines/mg24.pdf.

An adequate public facilities ordinance ties development approvals to the availability and adequacy of facilities such as schools.

Transfer of Development Rights

Transfer of Development Rights (TDR) is a program established by local zoning ordinance. Its intention is to relocate potential "right to develop" from areas where proposed land use or environmental impacts are undesirable (the "sending" site) to another site (the "receiving" site). The receiving sites are usually in higher density areas, downtowns, or growth centers where growth is promoted through the transfer of development density. TDRs are often used to protect open space or environmentally sensitive areas such as wetlands, farmland, forests , or critical wildlife habitat.

TDRs protect land permanently while still keeping it in private ownership. Landowners can retain their equity by selling development rights. Participation in a TDR program is usually voluntary. While the seller of development rights still owns the sending area land and can continue using it, a conservation easement is placed on the property that prevents or strictly limits further development. TDR contracts are more permanent than traditional zoning regulations and can accomplish multiple goals at once, such as protecting farmland, preserving environmentally sensitive areas, developing compact urban areas, promoting downtown commercial growth, and preserving historic landmarks. To learn more about TDRs in Pennsylvania, visit this Web site sponsored by the Pennsylvania Land Trust Association: http://conservationtools.org/guides/show/12-Transfer-of-Development-Rights.

Transfer of development rights can be used to protect environmentally sensitive areas such as forests.

Urban Growth Boundaries

Urban growth boundaries (UGB) affect the velocity and density of development. UGBs are delineated on a map and adopted in a comprehensive plan to identify where future development can occur over a set period of time (usually 20 years). Through the use of rural resource or other zoning districts, new development and expansion of water and sewer cannot occur beyond the established urban growth boundary. Land outside the boundary remains primarily for agriculture, forestry, or limited low-density residential development while land within the boundary is used to accommodate new growth.

It is important that zoning regulations for areas within the UGB allow a mix of residential, commercial, industrial, and institutional development at densities sufficient for the expected amount of growth over the specified time period. This ensures that anticipated growth and development are permitted and that compact development patterns are promoted.

Care should also be taken in defining the UGB. If the area within the boundary is not large enough, the cost of existing developable and already-developed land could increase beyond reasonable values, forcing development to other nearby communities. UGB programs must therefore be reviewed periodically to ensure that adequate land remains within the boundary to accommodate expected growth. Transfer of development rights is often used in conjunction with UGBs to allow property owners to receive the value of land outside the boundary with development restrictions.

Planners need to make sure that the area within an urban growth boundary allows a mix of development uses and is large enough for the expected growth.

The Nation's first formal example of an urban growth boundary occurred in Lexington/Fayette County, Kentucky, in 1958. Since then, a number of States and localities throughout the country have established urban growth boundary programs. Oregon established one of the most well-known, state-mandated urban growth boundary programs in 1973. The State created enabling legislation that required all cities to define urban growth boundaries to separate areas intended for development from those expected to remain in agricultural or forest use. To learn more about urban growth boundaries and Oregon's notable program, go to http://www.oregonmetro.gov/urban-growth-boundary.

Transportation Planning and Design

Coordinating transportation and land use planning is an important component of smart growth. Sprawling land uses create increased traffic and congestion. Increased traffic creates the need for new and wider roads, which allow people to travel farther and faster. New roads create opportunities for land development and growth in outlying areas, and the cycle continues. It is important that communities plan for roads and highways in a manner that supports sustainable communities rather than reacting to growing demand.

It is important that communities plan for roads and highways to support sustainable communities rather than reacting to growing demand.

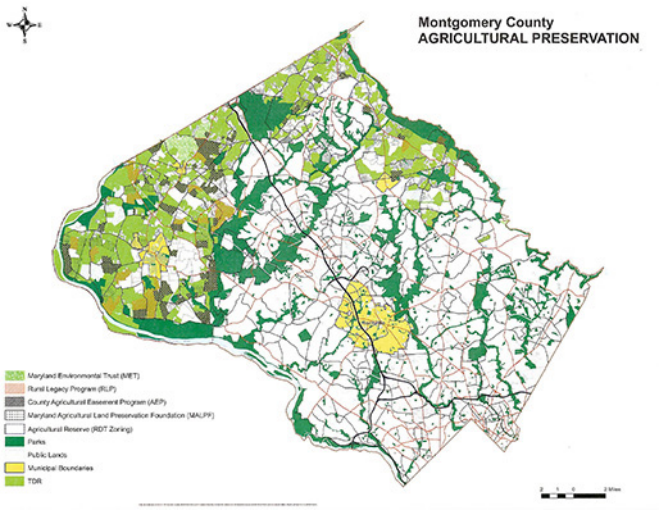
Federal, State, and local governments can work collaboratively to maintain and reinforce existing road networks that encourage development of existing open lots and redevelopment. Communities can also adopt policies that allow flexibility in roadway design, which incorporates safe, attractive, and comfortable access for all users. This includes pedestrians, transit users, and bicyclists, not just motorists. The Safe and Complete Streets Act of 2011, which was introduced in the House and Senate for consideration in early 2011, would require States to adopt principles for safe, accessible, and healthy streets. Many States have already passed complete street policy or legislation.

Creating attractive, safe, and convenient travel corridors for all users can:

- Encourage walking and bicycling
- Reduce automobile dependency
- Improve the efficiency and capacity of roads
- Better manage and allocate infrastructure costs
- Make development more attractive in urban areas

Case Study — Montgomery County, Maryland's Agricultural Land Preservation Program

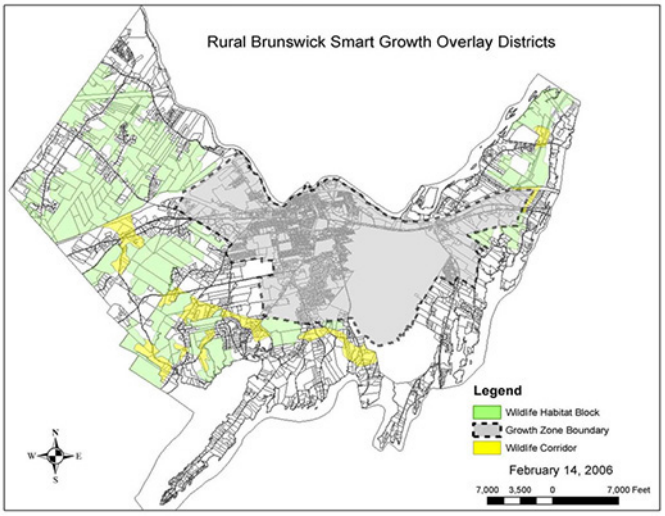
Montgomery County, Maryland, has one of the most successful farmland preservation programs in the United States, which began in 1980 to counter the loss of farmland from suburban sprawl. Landowners can choose from seven preservation programs set up by the county, such as the Legacy Open Space Program or the Montgomery County Transfer of Development Rights (TDR) Program. Each program will place an easement on the property to protect it from future development. Of the 72,000 acres of farmland protected in the county, more than 52,000 acres has been preserved through the TDR program alone. This is the highest percentage of preservation easements in the Nation. For more information, go to http://mda.maryland.gov/about_mda/Pages/md-land-preservation.aspx.



Map of Agricultural Preservation lands in Montgomery County, Maryland, as of 2010. (Map: Montgomery County Farmland Preservation Annual Report FY1980 – FY2010)

Case Study — Rural Brunswick Smart Growth Overlay Districts

In 2006, the Town of Brunswick, Maine, adopted Rural Brunswick Smart Growth Overlay Districts as part of its zoning ordinance to minimize fragmentation of large habitat blocks. Applicants proposing development within this Smart Growth Overlay District must meet certain mitigation requirements, which include identifying areas of disturbance and permanently protecting other land in the same block or corridor as the disturbance. The amount of mitigation required is related to the amount of habitat block or corridor that is being disturbed. For more information, see the Town of Brunswick Zoning Ordinance at http://www.brunswickme.org/wp-content/uploads/2014/08/Brunswick.Zoning.Ordinance.8.6.14.pdf.



Map of Rural Brunswick Smart Growth Overlay Districts as of February 14, 2006. (Map: Town of Brunswick Zoning Ordinance, October 20, 2010)

Relevant Factsheets

A1 – *Using Smart Growth Principles to Plan Sustainable Communities* – Introduces the principles and strategies of smart growth to create communities that are walkable, affordable, and offer more opportunities to manage growth in concert with conservation.

N3 – *Regulatory Approaches to Protecting Natural Resources* – Explains the difference between regulatory and nonregulatory approaches that protect natural resources and provides an overview of important Federal policies that drive them. Discussion centers on some of the more commonly used local regulatory tools and how they are used in the early phases of the development process.

N4 – *Nonregulatory Approaches to Natural Resource Conservation* – Discusses nonregulatory tools that have been used to preserve/conserve open space and other natural resources. It discusses how regulatory and nonregulatory tools can be used together and makes the point that nonregulatory tools can be just as effective as regulatory tools in planning for natural resources.

N5 – *Planning for Healthy Forests and Timber Operations* – Discusses the authorities that States have in regulating forestry activities and how municipal zoning ordinances are used to protect forests in States that do not have these authorities.

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